PHYSICS

BOOKS - UNIVERSAL BOOK DEPOT 1960 PHYSICS (HINGLISH)

THERMODYNAMICS

Isothermal Process

1. For an ideal gas, in an isothermal process

A. Heat content remains constant

B. Heat content and temperature remain constant

C. Temperature remains constant

D. None of the above

Answer: C

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2. Can two isothermal curves cut each other

A. Never

B. yes

C. They will cut when temperature is $0^{\circ}C$

D. Yes, when the pressure is critical pressure

Answer: A

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3. In an isothermal expansion

A. Internal energy of the gas increases

B. Internal energy of the gas decreases

C. Internal energy remains unchanged

D. Average kinetic energy of gas molecule decreases

Answer: C

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

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

B. $81R \log_e 2$

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

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

Answer: D

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5. A vessel containing 5 litres of a gas at 0.8 m pressure is connected to an evacuated vessel of volume 3 litres. The resultant pressure inside with be (assuming whole system to be isolated)

A. 4/5 m

B. 0.5 m

C. 2.0 m

D. 3/4 m

Answer: B

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

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

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

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

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

Answer: B

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

A. Isothermal changes only

B. Adiabatic changes only

C. Both isothermal and adiabatic changes

D. Neither isothermal nor adiabatic changes

Answer: C

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8. One mole of O_2 gas having a volume equal to 22.4 litres at $0^\circ C$ and 1 atmospheric pressure is compressed isothermally so that its volume reduces to 11.2 litres. The work done in this process is

A. 1672.5 j

B. 1728 j

C. $-1728j$

D. $-1572.5j$

Answer: D

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9. If a gas is heated at constant pressure, its isothermal compressibility

A. Remains constant

B. Increases linearly with temperature

C. Decreases linearly with temperature

D. Decreases inversely with temperature

Answer: A

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10. Work done per mol in an isothermal change is

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

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

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

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

Answer: C

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11. The isothermal Bulk modulus of an ideal gas at pressure P is

A. P

B. λp

C. p/2

D. P / λ

Answer: A

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12. In isothermal expansion, the pressure is determined by

A. Temperature only

B. Compressibility only

C. Both temperature and compressibility

D. None of these

Answer: B

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13. The isothermal bulk modulus of a gas at atmospheric pressure is

A. $1.013 \times 10^{5} N / m^{2}$

B. $1.013 \times 10^{6} N / m^{2}$

C. $1.013 \times 10^{-11} N / m^{2}$

D. $1.013 \times 10^{11} N / m^{2}$

Answer: A

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14. In an isothermal change, an ideal gas obeys

A. Boyle's law

B. Charle's law

C. Gaylussac law

D. None of the above

Answer: A

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15. In isothermic process, which statement is wrong

A. Temperature is constant

B. Internal energy is constan

C. No exchange of energy

D. (a) and (b) are correct

Answer: C

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16. An ideal gas A and a real gas B have their volumes increases from $V \to 2V$ under isothermal condtitions. The increase in internal energy

A. Will be same in both a And B

B. Will be zero in both the gases

C. Of B will be more than that of A

D. Of A will be more than that of B

Answer: B

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17. The specific heat of a gas in an isothermal process is

A. infinite

B. Zero

C. Negative

D. Remains constant

Answer: A

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18. A thermally insulated container is divided into two parts by a screen. In one part the pressure and temperature are P and T for an ideal gas filled. In the second part it is vacuum. If now a small hole is created in the screen, then the temperature of the gas will

A. Decrease

B. Increase

C. Remains same

D. None of the above

Answer: C

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19. A container that suits the occurrence of an isothermal process should be made of

A. Copper

B. Glass

C. Wood

D. cloth

Answer: A

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20. In an isothermal process the volume of an ideal gas is halved. One can say that

A. Internal energy of the system decreases

B. Work done by the gas is positive

C. Work done by the gas is negative

D. Internal energy of the system increases

Answer: C

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21. A thermodynamic process in which temperature T of the system remains constant though other variable P and V may change, is called

A. Isochoric process

B. Isothermal process

C. Isobaric process

D. None of these

Answer: B

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22. If an ideal gas is compressed isothermally then

A. No work is done against gas

B. Heat is relased by the gas

C. The internal energy of gas will increase

D. Pressure does not change

Answer: B

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

A. 1.5×10^3 cal of heat flowed out from the gas

B. 1.5×10^3 cal of heat flowed into the gas

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

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

Answer: A

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24. 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: A

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

A. 0.00091 joule

B. 0.0182joule

C. -0.0091joule

D. -0.0182joule

Answer: A

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26. 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. 2072j

D. 1904j

Answer: C

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27. 540 calories of heat convert 1 cubic centimeter of water at C o100 into 1671 cubic centimeter of steam at C o100 at a pressure of one atmosphere. Then the work done against the atmospheric pressure is nearly

A. 540 cal

B. 40 cal

C. Zero cal

D. 500 cal

Answer: B

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28. 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. 750joules

B. 1728joules

C. 1500joules

D. 3456joules

Answer: B

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

A. 543 j

B. 345 j

C. 453 j

D. 600j

Answer: B

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30. The volume of an ideal gas is 1 litre and its pressure is equal to 72 cm of mercury column. The volume of gas is made 900 cm 3 by compressing it isothermally. The stress of the gas will be

A. 8 cm (mercury)

B. 7 cm(mercury)

C. 6 cm (mercury)

D. 4 cm(mercury)

Answer: A

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31. During an isothermal expansion of an ideal gas

A. Its internal energy decreases

B. Its internal energy does not change

C. The work done by the gas is equal to the quantity of heat absorbed by i

D. Both (b) and (c) are correct

Answer: D

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Adiabatic Process

1. If a cylinder containing a gas at high pressure explodes, the gas undergoes

A. Reversible adiabatic change and fall of temperature

B. Reversible adiabatic change and rise of temperature

C. Irreversible adiabatic change and fall of temperature

D. Irreversible adiabatic change and rise of temperature

Answer: C

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2. Statement-1 : In an adiabatic process, change in internal energy of a gas is equal to work done on/by the gas in the process.

Statement-2 : This is because temp.of gas remains constant in an adiabatic process.

A. Change is pressure

B. Change is volume

C. Change in temperature

D. None of the above

Answer: C

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3. How does internal energy of a gas change in adiabatic expansion?

A. $\Delta U = 0$

B. $\Delta U =$ negative

C. $\Delta U =$ positive

D. $\Delta W =$ zero

Answer: B

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

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

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

Answer: D

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5. A gas at NTP is suddenly compressed to one-fourth of its original volume. If. λ is supposed to be $\frac{3}{2}$, then the final perssure is

A. 4 atmosphere

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

C. 8 atmosphere

D. $\frac{1}{4}$ atmosphere

Answer: C

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6. A monoatomic gas $(\gamma = 5/3)$ is suddenly compressed to $(1/8)$ of its volume adiabatically then the pressure of the gas will change to

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

B. 8

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

D. 32 times its initial perssure

Answer: D

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7. The pressure and density of a diatomic gas $(\gamma = 7/5)$ change adiabatically from (p,d) to (p', d'). If $\frac{d'}{d} = 32$, then $\frac{P'}{P}$ should be

A. 1/128

B. 32

C. 128

D. None of the above

Answer: C

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8. 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: B

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9. Two identical samples of gases are allowed to expand to the same final volume (i) isothermally (ii) adiabatically. Work done is

A. More in the isothermal process

B. More in the adiabatic process

C. Neither of them

D. Equal in both processes

Answer: A

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10. Which is the correct statement

A. For an isothermal change PV= constant

B. In an isothermal process the change in internal energy must be equal to the work done

C. For an adiabatic change $\frac{P_2}{P_1} = \left(\frac{V_2}{V_1}\right)^{\lambda}$ where λ is the ratio of specific heats

D. In an adiabatic process work done must be equal to the heat entering the system

Answer: A

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11. The ratio of slopes of adiabatic and isothermal curves is

A. γ

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

C. γ^2

D. γ^3

Answer: A

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12. An ideal gas undergoing adiabatic change has the following pressure-temperature relationship

A. $PT^{\lambda} =$ constant

B. $PT^{1+\lambda} =$ constant

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

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

Answer: D

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13. The amount of work done in an adiabatic expansion from temperature T to T_1 is

A. $R(T - T_1)$

B. $\frac{R}{\lambda - 1}(T - T_1)$

C. RT

D. $R(T - T_1)(\lambda - 1)$

Answer: B

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

A. 1J

B. $-1j$

C. $2j$

D. $-2j$

Answer: D

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15. The adiabatic elasticity of hydrogen gas $(\gamma = 1.4)$ at NTP

A. $1 \times 10^5 N/m^2$

B. $1 \times 10^{-8} N/m^2$

C. $1.4 \times N/m^2$

D. $1.4 \times 10^5 N/m^2$

Answer: D

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16. If λ denotes the ratio of two specific heats of a gas, the ratio of slopes of adiabatic and isothermal PV curves at their point of intersection is

A. $1/\lambda$

B. λ

C. $\lambda-1$

D. $\lambda+1$

Answer: B

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17. A gas is contained in a metallic cylinder fitted with a piston. The piston is suddenly moved in to compress the gas and is maintained at this position. As time passes the pressure of the gas in the cylinder

A. The pressure decreases

B. The pressure increases

C. The pressure remains the same

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

Answer: A

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18. When a gas expands adiabatically

A. No energy is required for expansion

B. Energy is required and it comes from the wall of the container of the gas

C. Internal energy of the gas is used in doing work

D. Law of conservation of energy does not hold

Answer: C

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19. One gm mol of a diatomic gas $(\gamma = 1.4)$ is compressed adiabatically so that its temperature rises from $27^{\circ}C$ to $127^{\circ}C$. The work done will be

A. 2077.5joules

B. 207.5joules

C. 207.5joules

D. None of the above

Answer: A

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20. Compressed air in the tube of a wheel of a cycle at normal temperature suddenly starts coming out from a puncture. The air inside

A. Starts becoming hotter

B. Remains at the same temperature

C. Starts becoming cooler

D. May become hotter or cooler depending upon the amount of water vapour present

Answer: C

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21. The adiabatic Bulk modulus of a perfect gas at pressure is given by

A. P

B. $2P$

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

D. λP

Answer: D

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22. An adiabatic process occurs at constant

A. Temperature

B. Pressure

C. Heat

D. Temperatuer and Pressure

Answer: C

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23. A polyatomic gas $\left(\lambda = \frac{4}{3}\right)$ is compressed to $\frac{1}{8}$ of its voulme Adiabatically. If initial pressure is P_0, Its mew perssure will be

A. $8P_0$

B. $16P_0$

C. $6P_0$

D. $2P_0$

Answer: B

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

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

B. $T^{\lambda} V = $ Constant

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

D. $TV^{\lambda} = $ constant

Answer: C

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25. An ideal gas is expanded adiabatically at an initial temperature of 300 K so that its volume is doubled. The final temperature of the hydrogen gas is $\lambda = 1.40)$

A. 227.36 k

B. 500.30 k

C. 454.76 k

D. -47°

Answer: A

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26. 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: B

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27. During the adiabatic expansion of 2 moles of a gas, the internal energy was found to have decreased by 100 J . The work done by the gas in this process is

A. Zero

B. $-100j$

C. $200j$

D. $100j$

Answer: D

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28. In an adiabatic expansion of a gas initial and final temperatures are T_1 and T_2 respectively, then the change in internal energy of the gas is

A. $\frac{R}{\lambda}(T_2 - T_1)$

B. $\frac{R}{\lambda - 1}(T_1 - T_2)$

C. $R(T_1 - T_2)$

D. Zero

Answer: A

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29. 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°

B. $9327^{\circ} C$

C. $1200^{\circ} C$

D. $927^{\circ} C$

Answer: D

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30. A cycle tyre bursts suddenly. This represents an

A. Isothermal process

B. Isobaric process

C. Isochoric process

D. Adiabatic process

Answer: D

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31. One mole of helium is adiabatically expanded from its initial state (P_i, V_i, T_i) to its final state (P_f, V_f, T_f). The decrease in the internal energy associated with this expansion is equal to

A. $C_V(T_i - T_f)$

B. $C_P(T_iT_f)$

C. $\frac{1}{2}(C_P + C_V)(Ti - Tf)$

D. $(C_p + C_V)(T_i - T_f)$

Answer: A

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32. At N.T.P. one mole of diatomic gas is compressed adiabatically to half of its volume $\lambda = 1.41$. The work done on gas will be

A. $1280j$

B. $1610j$

C. $1815j$

D. $2025j$

Answer: C

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33. For adiabatic process, wrong statement is

A. $dQ = 0$

B. $dU + dW$

C. $Q = \text{constant}$

D. Entropy is not constant

Answer: D

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34. A diatomic gas initially at 18° is compressed adiabatically to one- eighth of its original volume. The temperature after compression will b

A. 10°

B. 887°

C. 668k

D. 144°

Answer: C

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35. A gas is being compressed adiabatically. The specific heat of the gas during compression is

A. Zero

B. Infinite

C. Finite but non zero

D. Undefined

Answer: A

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

A. Isochoric

B. Isobaric

C. Isothermal

D. Adiabatic

Answer: D

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37. Two moles of an ideal monoatomic gas at $27^{\circ} C$occupies a volume of V . If the gas is expanded adiabatically to the volume , 2V then the work done by the gas will be $[\lambda = 5/3, R = 8.31j/molK]$

A. $-2767.23j$

B. $2767.23j$

C. $2500j$

D. $-2500j$

Answer: B

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38. At 27° a gas is suddenly compersssed such that its pressure become $\frac{1}{8}th$ of original pressure. Temperature of the gas will be $(\lambda = 5/3)$

A. 420 k

B. $327^{\circ}C$

C. 300k

D. -142°

Answer: D

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39. $\Delta U + \Delta W = 0$is valid for

A. Adiabatic process

B. Isothermal process

C. Isobaric process

D. Isochoric process

Answer: A

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40. An ideal gas at pressure of 1 atmosphere and temperature of $27^{\circ} C$ is compressed adiabatically until its pressure becomes 8 times the initial pressure, then the final temperature is $(\gamma = 3/2)$

A. $627^{\circ} C$

B. $527^{\circ} C$

C. $427^{\circ} C$

D. $327^{\circ} C$

Answer: D

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41. Air is filled in a motor tube at $27^{\circ} C$ and at a pressure of 8 atmospheres.The tube suddenly bursts, then temperature of air is

[Given γ of air $= 1.5$]

A. $27.5^{\circ}C$

B. $75^{\circ}K$

C. 150 k

D. $150^{\circ}C$

Answer: C

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

A. $p' = p$

B. $p' = 2p$

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

D. $p' = 7p$

Answer: C

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

A. $T_1V_1^{\lambda-1} = T_2T_2^{\lambda-1}$

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

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

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

Answer: A

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

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

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

C. 2

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

Answer: A

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45. In adiabatic expansion of a gas

A. Its pressure increases

B. Its density increases

C. Its thermal energy increases

D. Its thermal energy increase

Answer: B

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46. 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

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47. A gas is suddenly compressed to $\frac{1}{4}th$ of its original volume. Caculate the rise in temperature when original temperature is $27^\circ C. \gamma = 1.5.$

A. 273k

B. 573k

C. 373k

D. 473k

Answer: A

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48. A gas $(\lambda = 1.3)$ is enclosed in an insulated vessel fitted with insulating piston at a pressure of $10^5 N/m^2$. On suddenly pressing the piston the volume is reduced to half the initial volume. The final pressure of the gas is

A. $2^{0.7} \times 10^5$

B. $2^{1.3} \times 10^5$

C. $2^{1.4} \times 10^5$

D. None of these

Answer: B

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49. The internal energy of the gas increases In

A. Adiabatic expansion

B. Adiabatic compression

C. Isothermal expansion

D. Isothermal compression

Answer: B

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

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

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

C. $\Delta U = -w$ in an isothermal process

D. $\Delta U = W$in an isothermal process

Answer: A

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51. A gas is suddenly compressed to one fourth of its original volume. What will be its final pressure, if its initial pressure is p

A. Less then p

B. Moer then P

C. p

D. Either(a) or ©

Answer: B

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

A. $1:16$

B. $1:8$

C. $1:4$

D. $8:1$

Answer: D

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53. One mole of an ideal gas with $\gamma = 1.4$ is adiabatically compressed so that its temperature rises from $27^{\circ}C$ to $34^{\circ}C$. The change in the internal energy of the gas is $\left(R = 8.3 Jmol^{-1}k^{-1}\right)$

A. $-166j$

B. $166j$

C. $-168j$

D. $168j$

Answer: B

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54. The volume of a gas is reduced adibatically to $(1/4)$ of its volume at $27^{\circ}C$. if $\gamma = 1.4$. The new temperature will be

A. $340 \times 4^{0.4}K$

B. $300 \times 4^{0.4}K$

C. $150 \times 4^{0.4} K$

D. None of these

Answer: B

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55. During an adiabatic expansion of 2 moles of a gas, the change in internal energy was found -50 J . The work done during the process is

A. Zero

B. $100j$

C. $-50j$

D. $50j$

Answer: D

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56. Adiabatic modulus of elasticity of a gas is $2.1 \times 10^5 N/m^2$. What will be isothermal modulus if elasticity $\left(\frac{C_p}{C_v} = 1.4\right)$

A. $1.8 \times 10^5 N/m^2$

B. $1.5 \times 10^5 N/m^2$

C. $1.4 \times 10^5 N/m^2$

D. $1.2 \times 10^5 N/m^2$

Answer: B

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57. For an adiabatic expansion of a perfect gas, the value of $\frac{\Delta P}{P}$ is equal to

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

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

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

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

Answer: C

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Isobaric And Isochoric Processes

1. A gas expands under constant pressure P from volume V_1 toV_2The work done by the gas is

A. $P(V_2 - V_1)$

B. $P(V_1 - V_2)$

C. $P\left(V_1^{\lambda} - V_2^{\lambda}\right)$

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

Answer: A

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2. When heat in given to a gas in an isobaric process, then

A. The work is done by the gas

B. Internal energy of the gas increases

C. Both (a) and (b)

D. None from (a) and (b)

Answer: C

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3. 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: C

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4. A gas is compressed at a constant pressure of $50N/m^2$ from a volume $10m^3$ to a volume of $4m^3$. 100J of heat is added to the gas then its internal energy is

A. Increased by 400 J

B. Increased by 200 J

C. Increased by 100 J

D. Decreased by 200j

Answer: A

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5. 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. 54cal

B. 600cal

C. 60cal

D. 546cal

Answer: A

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6. Unit mass of liquid of volume V_1 completely turns into a gas of volume V_2 at constant atmospheric pressure P and temperature T. The latent heat of vaporization is "L". Then the change in internal energy of the gas is

A. Zero

B. $P(V_1 - V_2)$

C. $L - P(V_2 - V_1)$

D. L

Answer: C

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

A. 2.5 ergs

B. 250 j

C. 250 W

D. 340 N

Answer: C

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8. $2kg$ of water is converted into steam by boiling at atmospheric pressure. The volume changes from $2 \times 10^{-3} m^{-3}$ to $3.34 m^{3}$. The work done by the system is about

A. $-340kj$

B. $-170kj$

C. $170kj$

D. $340kj$

Answer: B

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9. 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. $54^\circ C$

B. $32.6^\circ C$

C. $327^\circ C$

D. 150 k

Answer: D

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10. 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: C

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

A. Adiabatic lt Isothermal lt Isobaric

B. Isobaric lt Adiabatic lt Isothermal

C. Adiabatic lt Isobaric lt Isothermal

D. None of these

Answer: C

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12. 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. Adiabatic

D. Equal in all cases

Answer:

Watch Video Solution

13. Which of the following is a slow process

A. Isothermal

B. Adiabatic

C. Isobaric

D. None of these

Answer: A

Watch Video Solution

14. 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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15. A Container having 1 mole of a gas at a temperature 27° has a movable piston which maintains at constant pressure in container of 1 atm . The gas is compressed until temperature becomes 127°. The work done is (C for gas is 7.03 cal / mol – K)

A. 703 j

B. 814 j

C. 121 j

D. 2035 j

Answer: D

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16. In a reversible isochoric change

A. $\Delta W = 0$

B. $\Delta Q = 0$

C. $\Delta T = 0$

D. $\Delta U = 0$

Answer: B

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17. Entropy of a thermodynamic system does not change when this system is used for

A. Conduction of heat from a hot reservoir to a cold reservoir

B. Conversion of heat into work isobarically

C. Conversion of heat into internal energy isochorically

D. Conversion of work into heat isochorically

Answer: A

Watch Video Solution

18. The work done in which of the following processes is zero

A. Isothermal process

B. Adiabatic process

C. Isochoric process

D. None of these

Answer: D

Watch Video Solution

19. In which thermodynamic process, volume remains same

A. Isobaric

B. Isothermal

C. Adiabatic

D. Isochoric

Answer: C

Watch Video Solution

20. In an isochoric process if $T_1 = 27^\circ C$ and $T_2 = 127^\circ C$ then P_1 / P_2 will be equal to

A. $\frac{9}{59}$

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

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

D. None of these

Answer: C

Watch Video Solution

21. Which is incorrect

A. In an isobaric process $\Delta p = 0$

B. In an isochoric process,$\Delta W = 0$

C. In an isothermal process $\Delta T = 0$

D. In an isothermal process $\Delta Q = 0$

Answer: D

Watch Video Solution

22. Which relation is correct for isometric process

A. $\Delta Q = \Delta U$

B. $\Delta W = \Delta U$

C. $\Delta Q = \Delta W$

D. None of these

Answer: D

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Heat Engine Refrigerator And Second Law Of Thermodynamics

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

A. 1800 j cycle

B. 1000 j cycle

C. 2000 j cycle

D. 1600 j cycle

Answer: D

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Watch Video Solution

2. The coefficient of performance of a Carnot refrigerator working between $30^\circ C$ and $0^\circ C$ is

A. 10

B. 1

C. 9

D. 0

Answer: C

Watch Video Solution

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

A. Room is cooled

B. Room is heated

C. Room is either cooled or heated

D. Room is neither cooled nor heated

Answer: B

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4. In a cyclic process, the internal energy of the gas

A. Increases

B. Decreases

C. Remains constant

D. Becomes zero

Answer: C

Watch Video Solution

5. Irreversible process is

A. Adiabatic process

B. Joule-Thomson expansion

C. Ideal isothermal process

D. None of the above

Answer: B

View Text Solution

6. For a reversible process, necessary condition is

A. In the whole cycle of the system, the loss of any type of heat energy should be zero

B. That the process should be too fast

C. That the process should be slow so that the working substance should remain in thermal and mechanical equilibrium with the surroundings

D. The loss of energy should be zero and it should be quasistatic

Answer: D

View Text Solution

7. In a cyclic process, work done by the system is

A. Zero

B. Equal to heat given to the system

C. More than the heat given to system

D. Independent of heat given to the system

Answer: B

Watch Video Solution

8. 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

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9. Efficiency of Carnot engine is 100% if

A. $T_2 = 273K$

B. $T_2 = 0K$

C. $T_1 = 273K$

D. $T_1 = 0K$

Answer: B

Watch Video Solution

10. A Carnot's engine used first an ideal monoatomic gas then an ideal diatomic gas. If the source and sink temperature are $411^\circ C$ and $69^\circ C$ respectively and the engine extracts $1000J$ of heat in each cycle, then area enclosed by the PV diagram is

A. 100 j

B. 300 j

C. 500 j

D. 700 j

Answer: B

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11. A Carnot engine absorbs an amount Q of heat from a reservoir at an absolute temperature T and rejects heat to a sink at a temperature of $T/3$. The amount of heat rejects is

A. Q/4

B. Q/3

C. Q/2

D. 2Q/3

Answer: B

Watch Video Solution

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: B

Watch Video Solution

13. An ideal Carnot's engine whose efficiency 40% receives heat of 500K. If the efficiency is to be 50% then the temperature of sink will be

A. 300 k

B. 400 k

C. 500k

D. 700 k

Answer: C

Watch Video Solution

14. In a Carnot engine when $T_2 = 0^\circ C$ and $T_1 = 200^\circ C$ its efficiency is η_1 and when $T_1 = 0^\circ C$ and $T_2 = -200^\circ C$. Its efficiency is η_2, then what is η_1 / η_2?

A. 0.577

B. 0.733

C. 0.638

D. Can not be calculated

Answer: A

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15. A carnot's engine works between a source at a temperature of $27^\circ C$ and a sink at $-123^\circ C$. Its efficiency is

A. 0.5

B. 0.24

C. 0.0075

D. 0.004

Answer: A

Watch Video Solution

16. A Carnot engine operates between $277^{\circ}C$ and . $27^{\circ}C$Efficiency of the engine will be

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

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

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

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

Answer: A

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17. A measure of the degree of disorder of a system is known as

A. Isobaric

B. Isotropy

C. Enthalpy

D. Entropy

Answer: B

Watch Video Solution

18. A Carnot engine has the same efficiency between $800K$ to $500K$ and $xK \rightarrow 600K$. The value of x is

A. 1000 k

B. 960 k

C. 846 k

D. 754 k

Answer: D

Watch Video Solution

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

A. It is impossible

B. It is possible but less probable

C. It is quite probable

D. Data are incomplete

Answer: B

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20. A Carnot's engine is made to work between $200^\circ C$ and $0^\circ C$ first and then between $0^\circ C$ and $-200^\circ C$. The ratio of efficiencies of the engine in the two cases is

A. $1.73:1$

B. $1:1.73$

C. $1:1$

D. $1:2$

Answer: A

Watch Video Solution

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

A. 200 k

B. 400 k

C. 600 k

D. 800 k

Answer: B

Watch Video Solution

22. Even Carnot engine cannot give 100% efficiency because we cannot

A. Prevent radiation

B. Find ideal sources

C. Reach absolute zero temperature

D. Eliminate friction

Answer: B

Watch Video Solution

23. Even Carnot engine cannot give 100% efficiency because we cannot

A. Prevent radiation

B. Find ideal sources

C. Reach absolute zero temperature

D. Eliminate friction

Answer: C

Watch Video Solution

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

A. $4.2 \times 10^{6} j$

B. $8.2 \times 10^{6} j$

C. $16.8 \times 10^{6} j$

D. Zero

Answer: A

Watch Video Solution

25. The first operation involved in a Carnot cycle is

A. Isothermal expansion

B. Adiabatic expansion

C. Isothermal compression

D. Adiabatic compression

Answer: A

Watch Video Solution

26. For which combination of working temperatures the efficiency of Carnot's engine is highest

A. 80 k, 60 k

B. 100 k, 80 k

C. 60 k, 40 k

D. 40 k, 20 k

Answer: A

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27. The efficiency of Carnot engine when source temperature is T 1 and sink temperature is T 2 will be

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

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

C. $\frac{T_1 - T_2}{T_2}$

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

Answer: A

Watch Video Solution

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

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

B. η

C. 2η

D. 3η

Answer: B

Watch Video Solution

29. An ideal refrigerator has a freezer at a temperature of $-13^{\circ} C$. The coefficient of performance of the engine is 5. The temperature of the air (to which heat is rejected) will be

A. $235^{\circ} C$

B. $325^{\circ} C$

C. $39^{\circ} C$

D. $320^{\circ} C$

Answer: C

Watch Video Solution

30. In a mechanical refrigerator the low temperature coils are at a temperature of $-23^{\circ}C$ and the compressed gas in the condenser has a temperature of $27^{\circ}C$. The theoretical coefficient of performance is

A. 5

B. 8

C. 6

D. 6.5

Answer: C

Watch Video Solution

31. An engine is supposed to operate between two reservoirs at temperature $727^\circ C$ and $227^\circ C$. The maximum possible efficiency of such an engine is

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

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

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

D. 1

Answer: A

Watch Video Solution

32. An ideal gas heat engine operates in Carnot cycle between $227^\circ C$ and $127^\circ C$. It absorbs $6 \times 10^4 cals$ of heat at higher temperature. Amount of heat converted to work is

A. 2.4×10^4cal

B. 6×10^4cal

C. 1.2×10^4cal

D. 4.8×10^4cal

Answer: C

Watch Video Solution

33. Which of the following processes is reversible?

A. Transfer of heat by radiation

B. Electrical heating of a nichrome wire

C. Transfer of heat by conductio

D. Isothermal compression

Answer: C

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Objective Questions

1. 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: D

Watch Video Solution

2. $1cm^3$ of water at its boiling point absorbs $540cal$ of heat to become steam with a volume of $1671cm^3$. If the atmospheic pressure is $1.013 \times 10^5 N/m^2$ and the mechanical equivalent of heat $= 4.19J/cal$, the energy spent in this process in overcoming intermolecular forces is

A. 540 cal

B. 40 cal

C. 500 cal

D. Zero

Answer: C

Watch Video Solution

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

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

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

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

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

Answer: B::C

Watch Video Solution

4. Two identical containers A and B with frictionless pistons contain the same ideal gas at the same temperature and the same velocity V. The mass of the gas in A is m_A, and that in B is m_B. The gas in each cylinder is now allowed to expand isothermally to the same final volume 2V. The changes in the pressure in A and B are found to be ΔP and $1.5 \Delta P$ respectively. Then

A. $4 m_A = 9 m_B$

B. $2m_A = 3m_B$

C. $3m_A = 2m_B$

D. $9m_A = 3m_B$

Answer: C

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5. 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: D

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6. A closed hollow insulated cylinder is filled with gas at $0^{\circ} C$ and also contains an insulated piston of negligible weight and negligible thickness at the middle point. The gas on one side of the piston is heated to $100^{\circ} C$. If the piston moves $5 cm$ the length of the hollow cylinder is

A. 13.65

B. 27.3cm

C. 38.6cm

D. 64.6cm

Answer: D

Watch Video Solution

7. A mono atomic gas is supplied with the heat Q very slowly keeping the pressure constant. The work done by the gas will be

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

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

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

D. $\frac{1}{5}Q$

Answer: C

Watch Video Solution

8. 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: D

Watch Video Solution

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

A. $P_3 > P_1 W > 0$

B. $P_3 > P_1 W < 0$

C. $P_3 > P_1 W > 0$

D. $P_3 = P_1, W = 0$

Answer: C

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10. Work done by a system under isothermal change from a volume V_1 to V_2 for a gas which obeys Vander Waal's equation $(V-\beta n)\left(P+\frac{\alpha n^2}{V}\right)nRT$

A.

$$nRT\log_e\left(\frac{V_2-n\beta}{V_1-n\beta}\right)+\alpha n^2\left(\frac{V_1-V_2}{V_1V_2}\right)$$

B.

$$nRT\log_e\left(\frac{V_2-n\beta}{V_1-n\beta}\right)+\alpha n^2\left(\frac{V_1-V_2}{V_1V_2}\right)$$

C.

$$nRT\log_e\left(\frac{V_2-\alpha\beta}{V_1-n\alpha}\right)+\beta n^2\left(\frac{V_1-V_2}{V_1V_2}\right)$$

D.

$$nRT\log_e\left(\frac{V_1-\alpha\beta}{V_1-n\alpha}\right)+\alpha n^2\left(\frac{V_1V_2}{V_1-V_2}\right)$$

Answer: A

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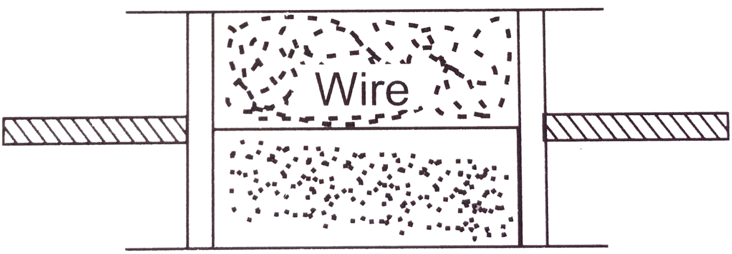
11. 

A cylindrical tube of uniform cross-sectional area A is fitted with two air tight frictionless pistons. The pistons are connected to each other by a metallic wire. Initially the pressure of the gas is P_0 and temperature is T_0, atmospheric pressure is also P_0. Now the temperature of the gas is increased to $2T_0$, the tension in the wire will be

A. $2P_0A$

B. P_0A

C. $\frac{P_0A}{2}$

D. $4P_0A$

Answer: B

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

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

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

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

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

Answer: C

Watch Video Solution

13. An insulator container contains 4 moles of an ideal diatomic gas at temperature T. Heat Q is supplied to this gas, due to which 2 moles of the gas are dissociated into atoms but temperature of the gas remains constant. Then

A. Q = 2RT

B. Q = RT

C. Q = 3RT

D. Q = 4RT

Answer: B

Watch Video Solution

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

A. 5%

B. 6%

C. 7%

D. 8%

Answer: C

Watch Video Solution

15. The temperature of a hypothetical gas increases to $\sqrt{2}$ times when compressed adiabatically to half the volume. Its equation can be written as

A. $PV^{3/2} =$ constant

B. $PV^{5/2} =$ constant

C. $PV^{7/3} =$ constant

D. $PV^{4/3} =$ constant

Answer: A

Watch Video Solution

16. Two Carnot engines are operated in succession. The first engine receives heat from a source at $T = 800K$ and rejects to sink at

$T_2 K$. 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. 100 k

B. 300 k

C. 550 k

D. 700 k

Answer: C

Watch Video Solution

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

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

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

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

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

Answer: B

Watch Video Solution

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

A. 40%

B. 30%

C. 60%

D. 20%

Answer: A

Watch Video Solution

19. Which one of the following gases possesses the largest internal energy

A. 2 moles of helium occupying $1m^2 at 300k$

B. 56 kg nitrogen at $107Nm^2$ and 300 k

C. 8 grams of oxygen at 8 atm and 300 k

D. 6×10^{26} moleculer of oxygen occupying

$40m^2$ at 900 k

Answer: B

Watch Video Solution

20. Two sample A and B of a gas initially at the same pressure and temperature are compressed from volume V to $V/2$ (A isothermally and B adiabatically). The final pressure of A is

A. Greater than the final pressure of B

B. Equal to the final pressure of

C. Less than the final pressure of B

D. wice the final pressure of B

Answer: C

Watch Video Solution

21. Initial pressure and volume of a gas are P and V respectively. First it is expanded isothermally to volume 4 V and then compressed adiabatically to volume V. The final pressure of gas will be (given $\gamma = \frac{3}{2}$)

A. 1p

B. 2p

C. 4p

D. 8p

Answer: B

Watch Video Solution

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

A. 0 kj

B. 10 kj

C. 20 kj

D. 30 kj

Answer: D

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Watch Video Solution

23. A reversible engine converts one-sixth of the heat input into work. When the temperature of the sink is reduced by $62^{\circ}C$, the efficiency of the engine is doubled. The temperatures of the source and sink are

A. $80^{\circ}C, 37^{\circ}C$

B. $95^{\circ}C, 28^{\circ}C$

C. $90^{\circ}C, 37^{\circ}C$

D. $99^{\circ}C, 37^{\circ}C$

Answer: D

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24. An engineer claims to have made an engine delivering 10 kW power with fuel consumption of 1 g/sec . The calorific value of the fuel is 2 kcal/g . Is the claim of the engineer

A. Valid

B. Invaild

C. Depends of engine design

D. Depends on the load

Answer: B

View Text Solution

25. 100 gram of ice at $0^\circ C$ is converted into water vapour at $100^\circ C$ Calculate the change in entropy.

A. $-4.5cal/K$

B. $+4.5cal/K$

C. $+5.4cal/K$

D. $-5.4cal/K$

Answer: B

Watch Video Solution

26. 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: B

Watch Video Solution

27. 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. 840 k

B. 280 k

C. 560 k

D. 380 k

Answer: D

Watch Video Solution

28. P-V diagram of a diatomic gas is a straight line passing through origin. The molar heat capacity of the gas in the process will be

A. 4 R

B. _

C. 3R

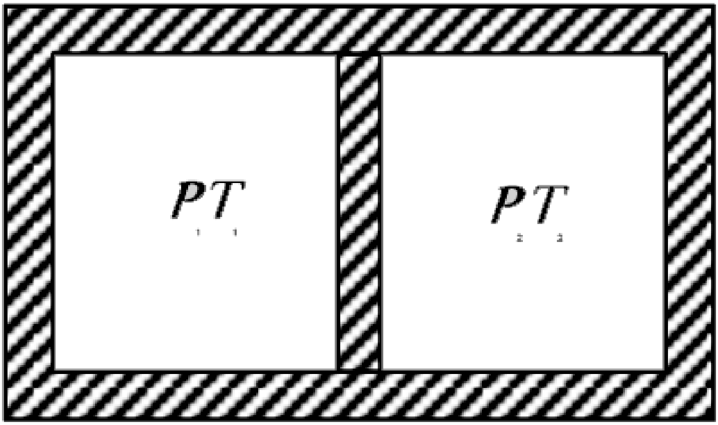
D. $\frac{4R}{3}$

Answer: C

Watch Video Solution

29. Following figure shows on adiabatic cylindrical container of volume V_0 divided by an adiabatic smooth piston (area of cross-section = A) in two equal parts. An ideal gas $\left(C_p / C_y = \lambda\right)$ is at pressure P and temperature T in left part and gas at pressure P and temperature T in right part. The piston is slowly displaced and released at a position where it can stay in equilibrium. The final pressure of the two parts will be (Suppose x =

displacement of the piston)



A. P_2

B. P_1

C. $\dfrac{P_1\left(\frac{V_0}{2}\right)^{\lambda}}{\left(\frac{V_0}{2}+Ax\right)^{\lambda}}$

D. $\dfrac{P_2\left(\frac{V_0}{2}\right)^{\lambda}}{\left(\frac{V_0}{2}+Ax\right)^{\lambda}}$

Answer: C

Watch Video Solution

30. Two cylinders A and B fitted with pistons contain equal amounts of an ideal diatomic gas at 300K. The piston of A is free to move, while that 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 30K, then the rise in temperature of the gas in B is

A. 30 k

B. 18 k

C. 50 k

D. 42 k

Answer: D

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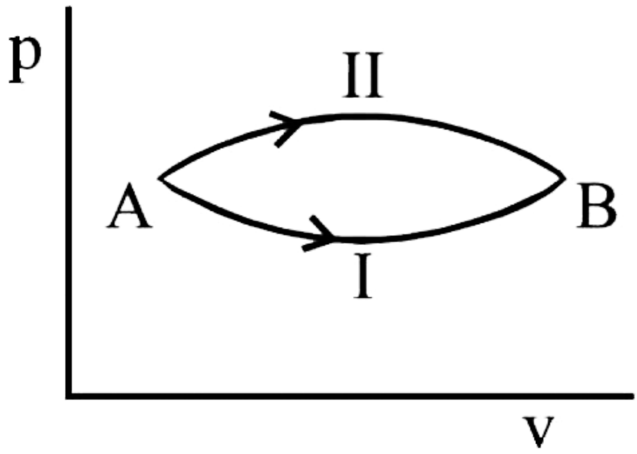
Graphical Questions

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



A. $\Delta U_{II} > \Delta U_I$

B. $\Delta U_{II} < \Delta U_I$

C. $\Delta U_{II} = \Delta U_I$

D. Relation between ΔU_I and ΔU_{II} can not be determined

Answer: C

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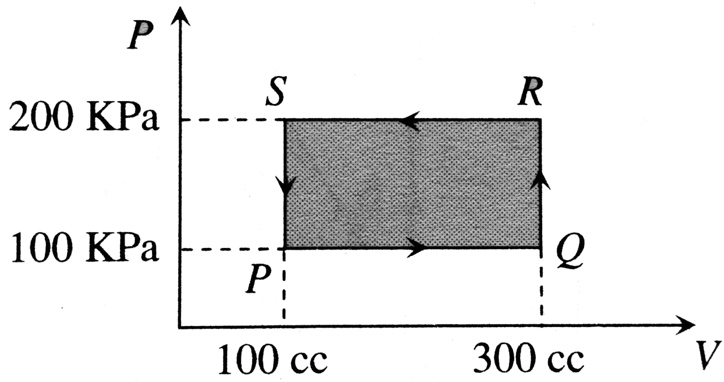
2. A thermodynamic system is taken through the cyclic $PQRSP$ process. The net work done by the system is



A. $10J$

B. $20J$

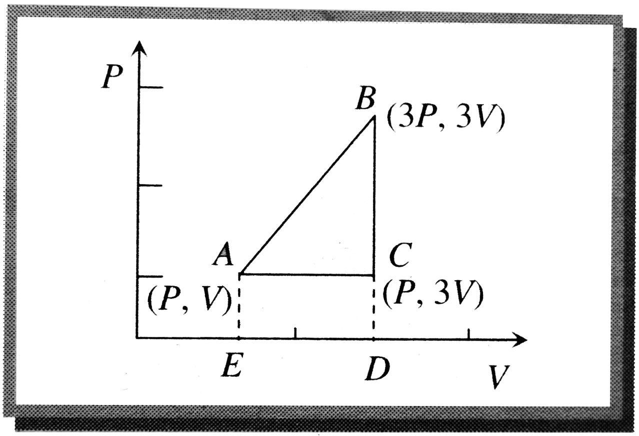
C. $-20J$

D. $400J$

Answer: B

Watch Video Solution

3. Anideal gas is taken around $ABCA$ as shown in the above $P-V$ diagram. The work done during a cycle is



A. 2PV

B. PV

C. 1/2PV

D. Zero

Answer: A

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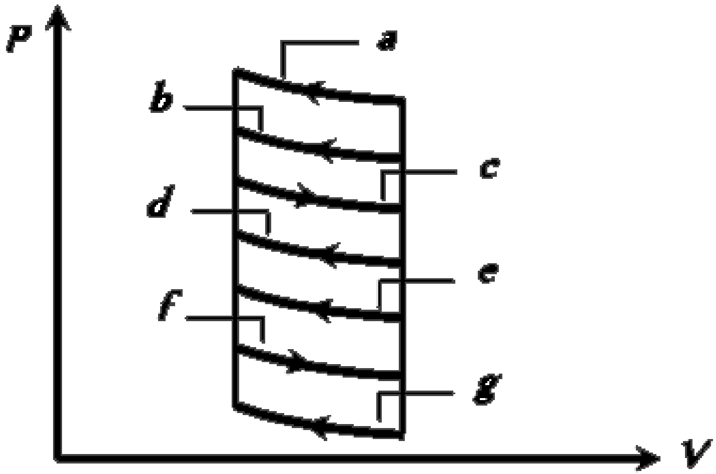
4. The P - V diagram shows seven curved paths (connected by vertical paths) that can be followed by a gas. Which two of them should be parts of a closed cycle if the net work done by the gas is to be at its maximum value



A. ac

B. cg

C. af

D. cd

Answer: C

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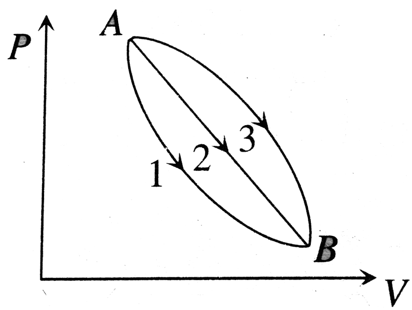
5. An ideal gas of mass m in a state A goes to another state B via three different processes as shown in Fig. If Q_1, Q_2 and Q_3 denote the heat absorbed by the gas along the three paths, then



A. $Q_1 < Q_2 < Q_3$

B. $Q_1 < Q_2 = Q_3$

C. `Q_(1)=Q_(2)ltQ_(3)

D. $Q_1 > Q_2 > Q_3$

Answer: A

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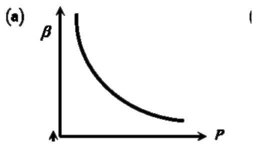
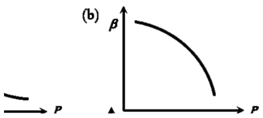
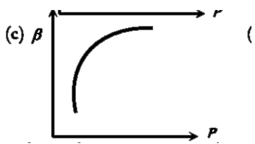
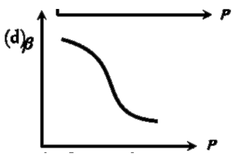
6. Which of the following graphs correctly represents the variation of $\beta = -\frac{dV/dP}{V}$

with P for an ideal gas at constant temperature?

A. 

B. 

C. 

D. 

Answer: A

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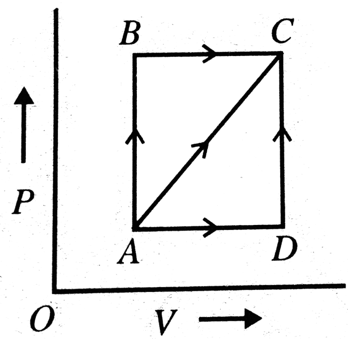
7. A thermodynamic process is shown in Fig. The pressures and volumes corresponding to some points in the figure are

$P_A = 3 \times 10^4 Pa\ V_A = 2 \times 10^{-3} m^3$

$P_B = 8 \times 10^4 Pa\ V_D = 5 \times 10^{-3} m^3$

In the process AB $600J$ of heat is added to the system. The change in internal energy of the system in the process AB would be



A. $560j$

B. $800j$

C. $600j$

D. $640j$

Answer: A

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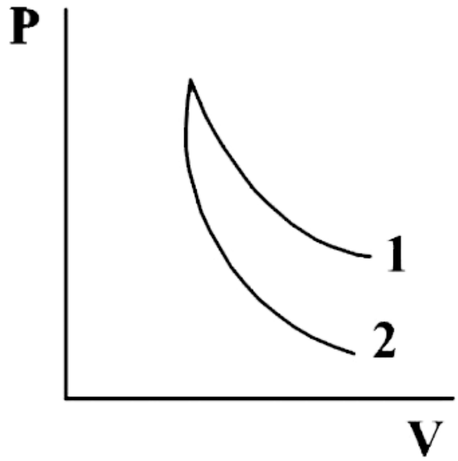
8. P-V plots for two gases during adiabatic processes are shown in the figure. Plots 1 and

2 should corresponds respectively to



A. He and O_2

B. O_2 and He

C. HE and Ar

D. O_2 and N_2

Answer: B

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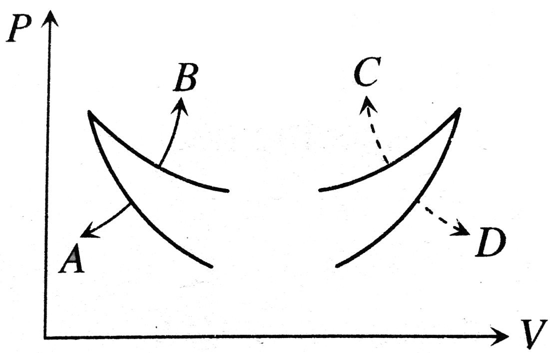
9. Four curves A, B, C and D are drawn in Fig. for a given amount of gas. The curves which represent adiabatic and isothermal changes



A. C and D respectively

B. D and C reslectively

C. A and B respectively

D. B and A respectively

Answer: C

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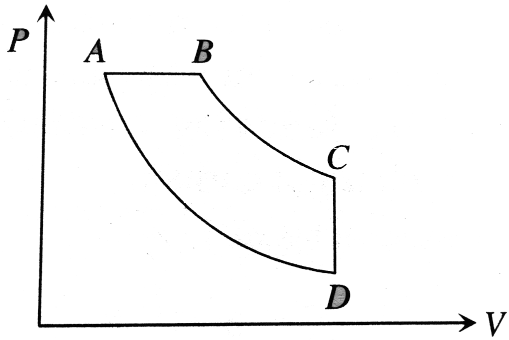
10. In the following pressure-volume diagram, the isochoric, isothermal and isobaric parts, respectively, are



A. BA,CB,DC

B. CD,CB,CD

C. AB,BC,AB

D. CD,DA,AB

Answer: D

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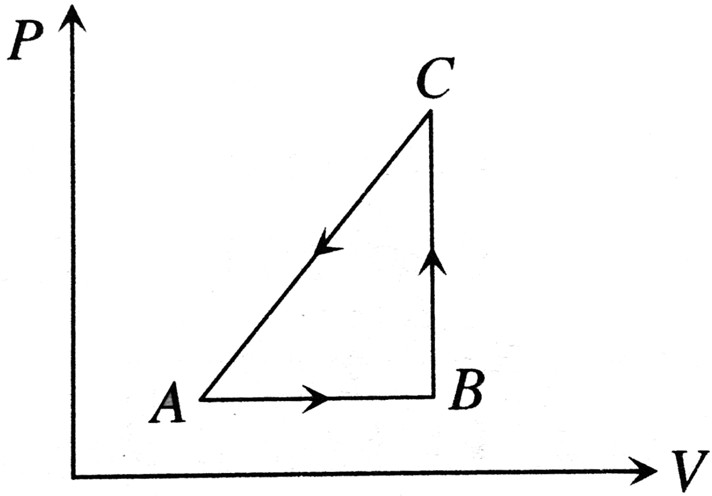
11. The $P-V$ diagram of a system undergoing thermodynnaic transformation is shown in Fig. The work done on the system in going from $A \rightarrow B \rightarrow C$ is $50J$ and $20cal$ heat is given to the system. The change in

internal erergy between A and C is



A. $34J$

B. $70J$

C. $84J$

D. $134J$

Answer: D

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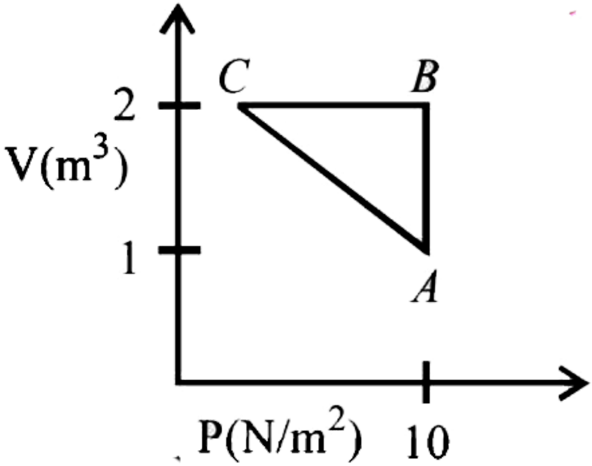
12. An ideal gas is taken through the cycle $A \rightarrow B \rightarrow C \rightarrow A$, as shown in the figure, If the net heat supplied to the gas in the cycle is 5J, the work done by the gas in the process

CtoA is



A. $-5J$

B. $-10J$

C. $-15J$

D. $20J$

Answer: A

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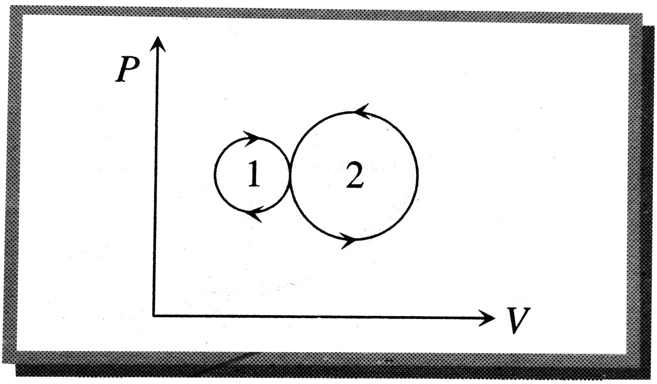
13. In the following indicator diagram, the net amount of work done will be



A. Positive

B. Negative

C. Zero

D. Infinity

Answer: B

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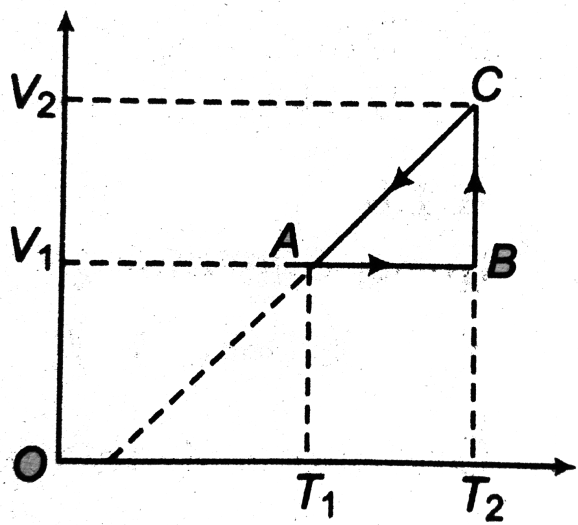
14. The cyclic process for 1 mole of an ideal gas is shown in the V-T diagram. The work done in

AB, BC and CA respectively is



A. $0,\ RT_2 In\left(\frac{V_1}{V_2}\right),\ R(T_1 - T_2)$

B. $R(T_1 - T_2),\ 0,\ RT_1 In\frac{V_1}{V_2}$

C. $0,\ RT_2 In\left(\frac{V_2}{V_1}\right),\ R(T_1 - T_2)$

D. $0,\ RT_2 In\left(\frac{V_2}{V_1}\right),\ R(T_2 - T_1)$

Answer: C

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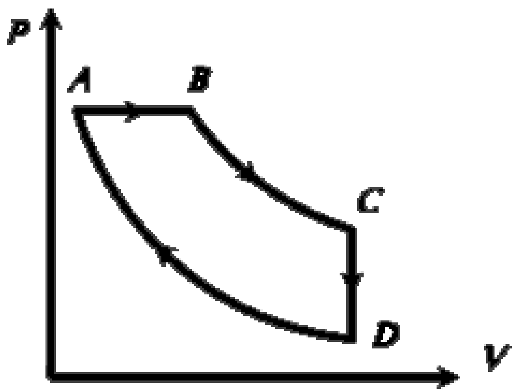
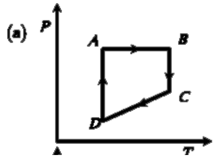
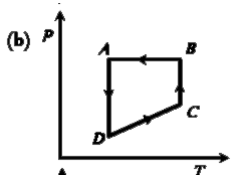
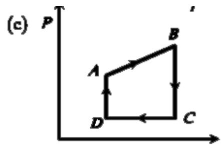
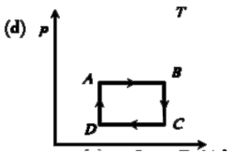
15. A cyclic process ABCD is shown in the figure P - V diagram. Which of the following curves represent the same process



A. 

B. 

C. 

D. 

Answer: A

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16. Carnot cycle (reversible) of a gas represented by a pressure volume curve is shown in the diagram

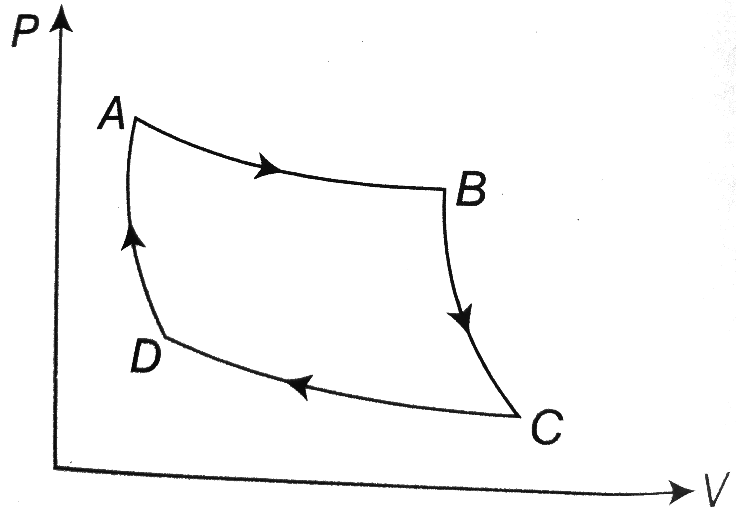
Consider the following statement

I Area ABCD = Work done on the gas

II Area ABCD = Net heat absorbed

III Change in the internal energy in cycle = 0

Which of these are correct?



A. I only

B. II only

C. II and III

D. I,II and III

Answer: C

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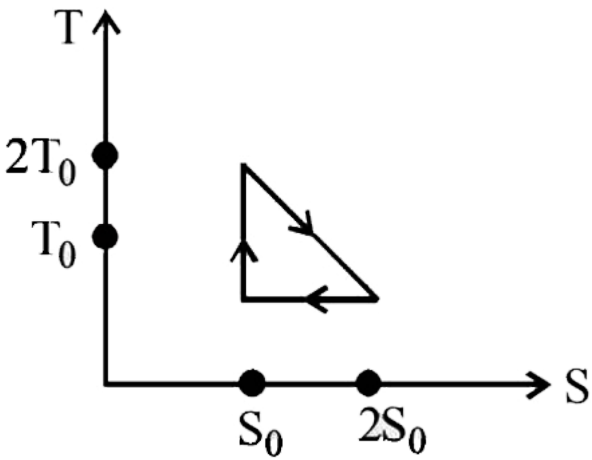
17. The temperature -entropy diagram of a reversible engine cycle is given in the figure. Its efficiency is



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

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

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

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

Answer: A

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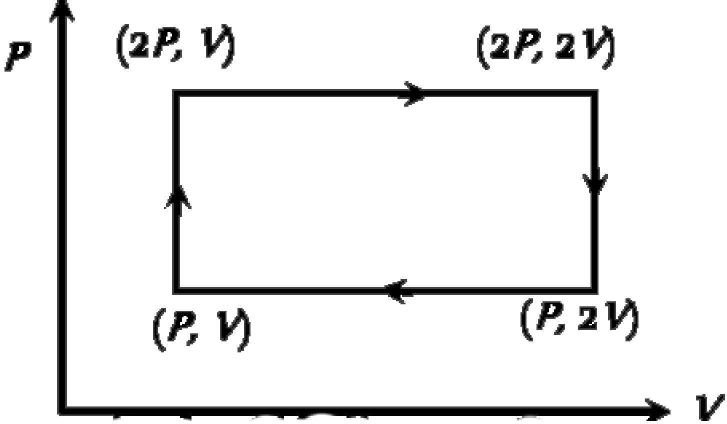
18. Work done in the given P - V diagram in the cyclic process is



A. 2p

B. 2PV

C. PV/2

D. 3pv

Answer: A

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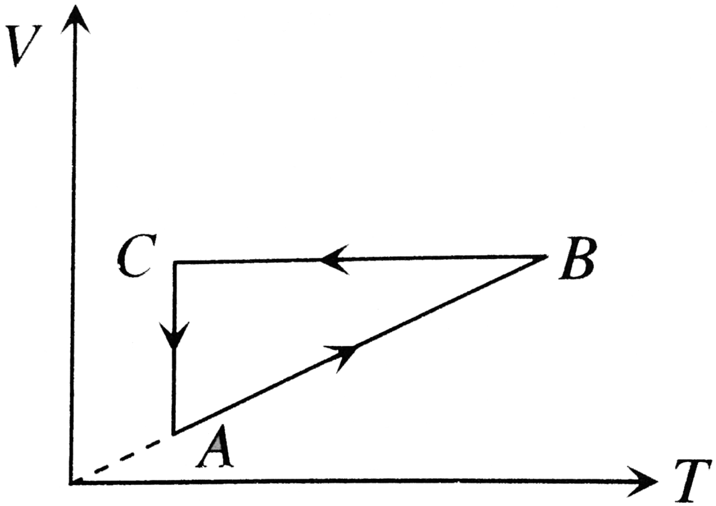
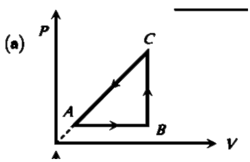
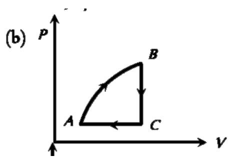
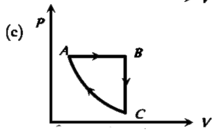
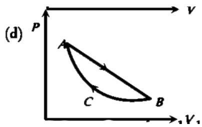
19. A cyclic process $ABCA$ is shown in the $V-T$ diagram process on the $P-V$



A. 

B. 

C. 

D. 

Answer: C

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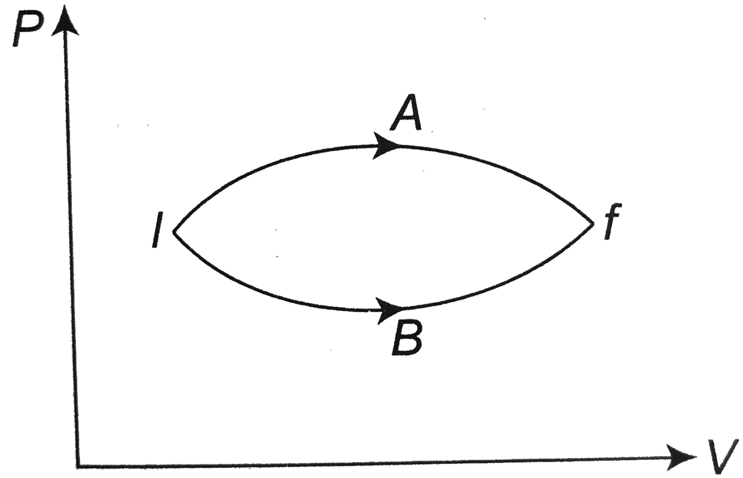
20. In the figure given two processes A and B are shown by which a thermodynamic system goes from initial to final state F. if ΔQ_A and ΔQ_B are respectively the heats supplied to the systems then



A. $\Delta Q_A = \Delta Q_B$

B. $\Delta Q_A \leq \Delta Q_B$

C. $\Delta Q_A < \Delta Q_B$

D. $\Delta Q_A > \Delta Q_B$

Answer: D

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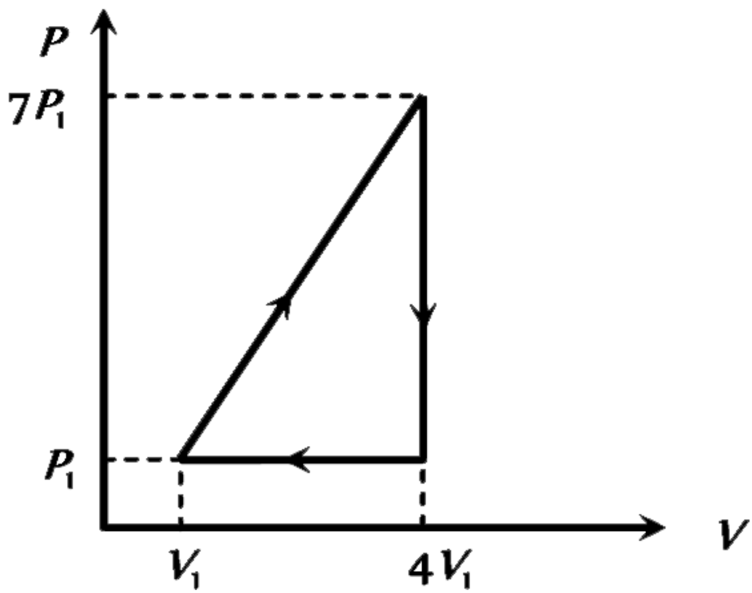
21. In the cyclic process shown in the figure, the work done by the gas in one cycle is



A. $28P_1V_1$

B. $14P_1V_1$

C. $18P_1V_1$

D. $9P_1V_1$

Answer: D

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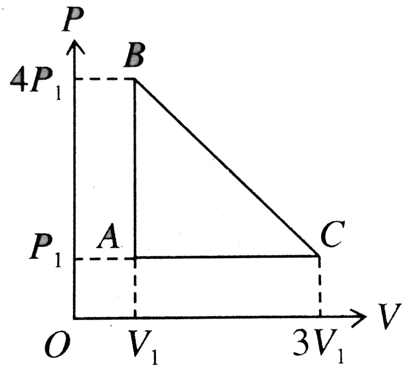
22. An ideal gas is taken around the cycle $ABCA$ shown in $P-V$ diagram. The net work done by the gas during the cycle is equal to



A. $12P_1V_1$

B. $6P_1V_1$

C. $3P_1V_1$

D. $2P_1V_1$

Answer: D

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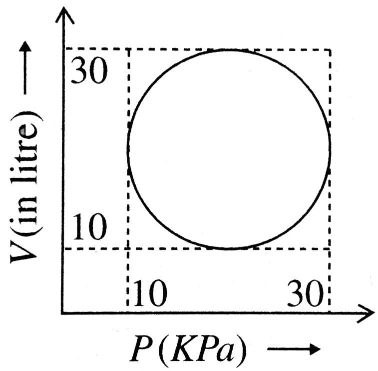
23. Heat energy absorbed by a system in going through a cyclic process shown in Fig.



A. $10\pi J$

B. $10\pi J$

C. $10\pi J$

D. $10^{-3}\pi J$

Answer: C

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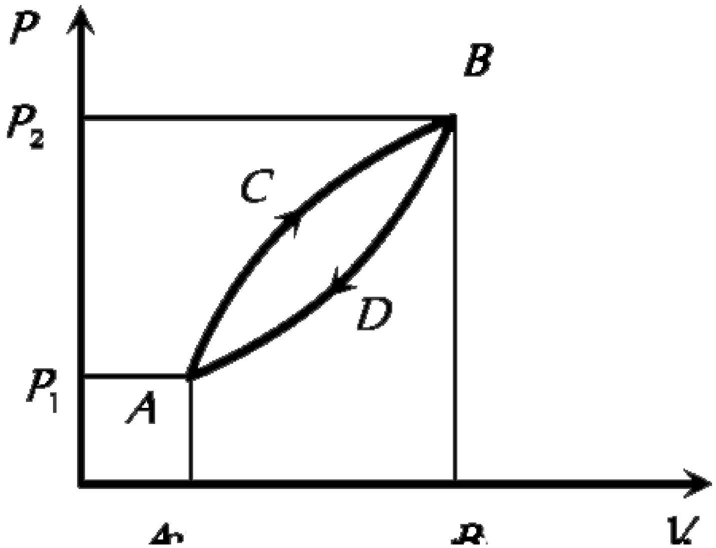
24. A thermodynamic system is taken from state A to B along ACB and is brought back to A along BDA as shown in the PV diagram. The net work done during the complete cycle is given by the area



A. PACBPP

B. ACBB'A'A

C. ACBDA

D. ADBB'A'A

Answer: C

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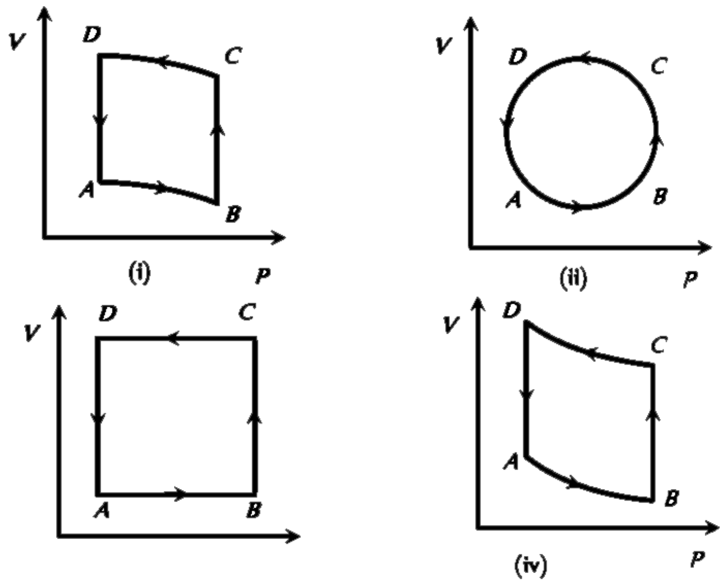
25. In the diagrams (i) to (iv) of variation of volume with changing pressure is shown. A gas is taken along the path ABCD . The change in internal energy of the gas will be



A. Positive in all cases (i) to (iv)

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

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

D. Zero in all four cases

Answer: D

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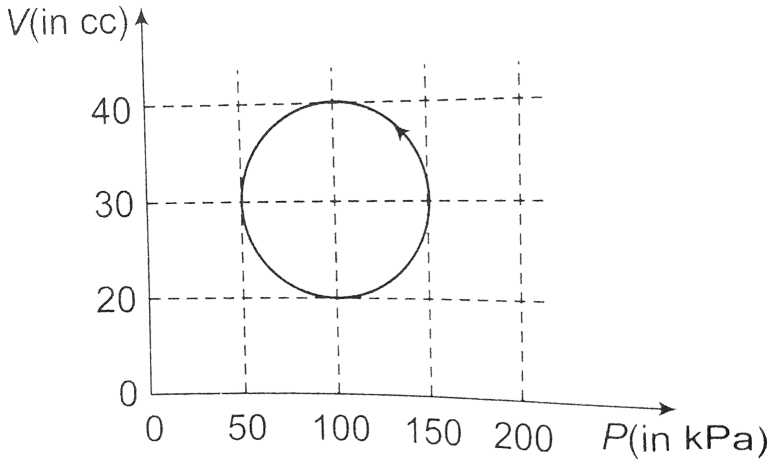
26.



A system is taken through a cyclic process represented by a circle as shown in the figure. The heat absorbed by the system is

A. $\pi \times 10^3 j$

B. $\frac{\pi}{2} j$

C. $4\pi \times 10^2 j$

D. πj

Answer: B

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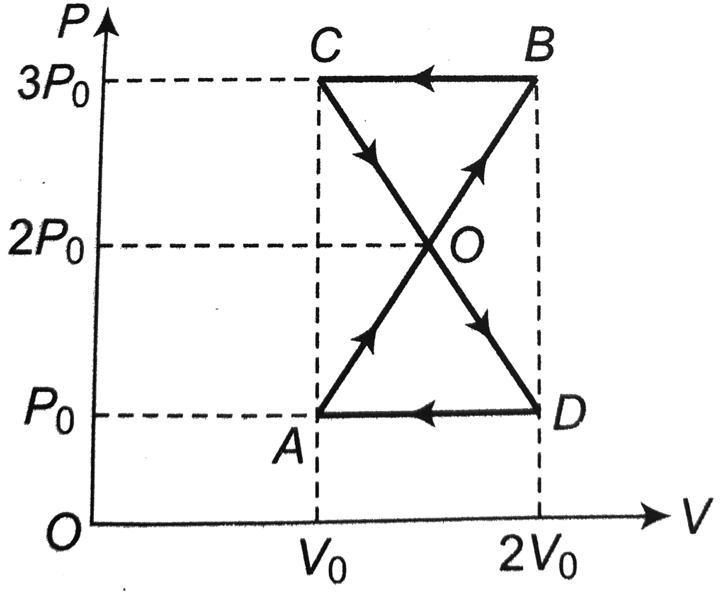
27. A thermodynamic system undergoes cyclic process $ABCDA$ as shown in figure. The work done by the system is



A. $P_0 V_0$

B. $2 P_0 V_0$

C. $\frac{P_0 V_0}{2}$

D. Zero

Answer: D

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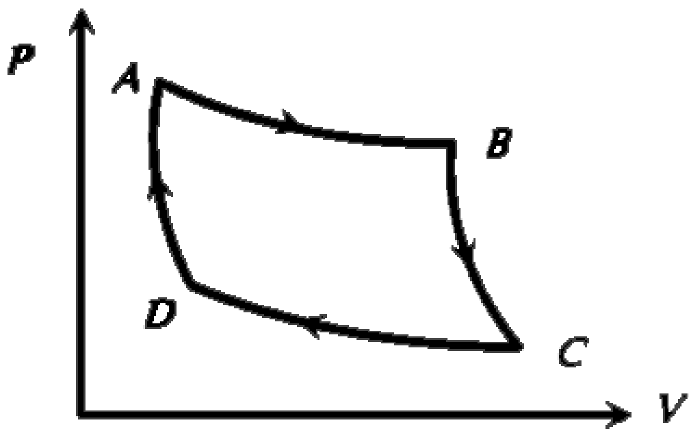
28. The P - V graph of an ideal gas cycle is shown here as below. The adiabatic process is described by



A. AB and BC

B. AB and CD

C. BC and DA

D. BC and CD

Answer: C

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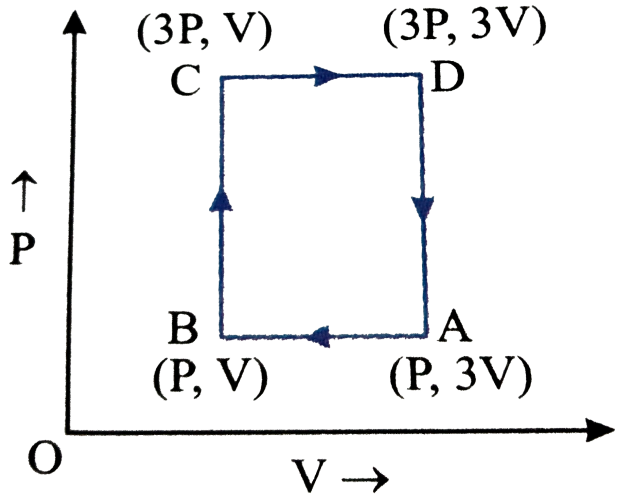
29. An ideal monoatomic gas is taken the cycle $ABCDA$ as shown in following $P-V$

diagram. The work done during the cycle is



A. PV

B. 2 PV

C. 4 PV

D. Zero

Answer: C

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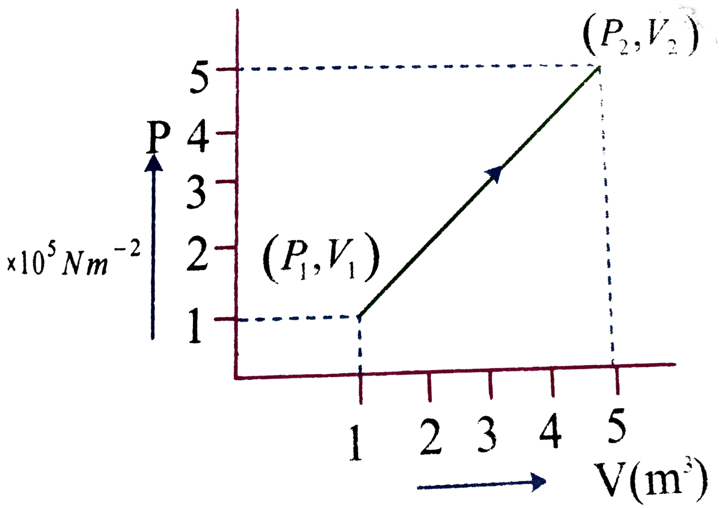
30. A system changes from the state (P_1, V_1) to (P_2V_2) as shwon in the diagram. The workdone by the system is



A. 7.5×10^5joule

B. 7.5×10^5erg

C. 12×10^5joule

D. 6×10^5joule

Answer: D

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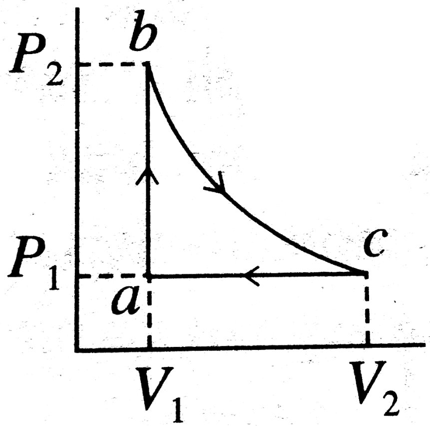
31. Carbon monoxide is carried around a closed cyclic processes abc, in which bc is an isothermal process, as shown in Fig. The gas absorbs $7000 J$ of heat as its temperature is increased from $300K$ to $1000K$ in going from a to b. The quantity of heat ejected by the gas during the process ca is



A. $4200j$

B. $5000j$

C. $9000j$

D. $9800j$

Answer: D

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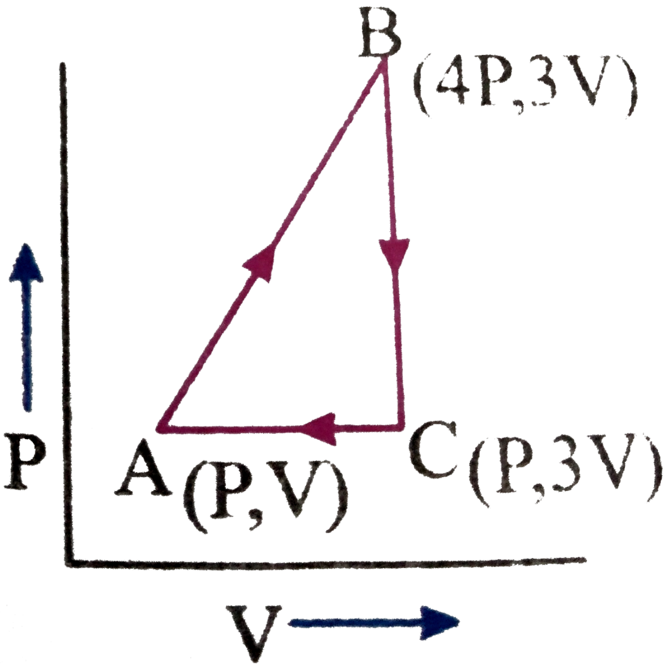
32. A sample of an ideal monoatomic gas is taken round the cycle ABCA as shown in the figure the work done during the cycle is



A. Zero

B. 2 PV

C. 6 PV

D. 9 PV

Answer: B

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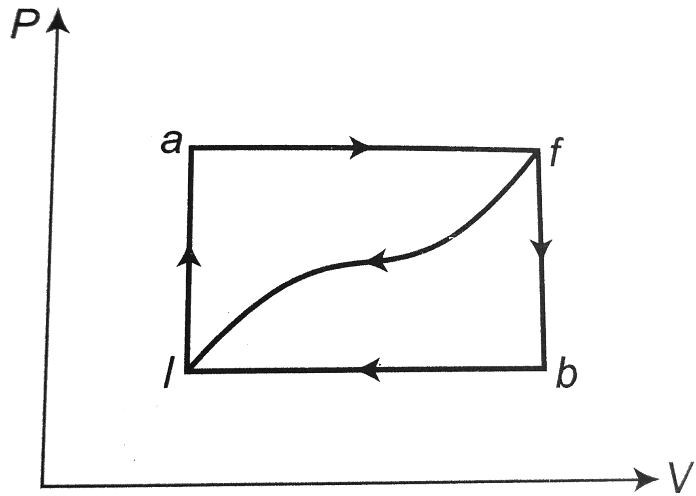
33. When a system is taken from state f along path iaf, $Q = 50J$ and $W = 20J$. Along path ibf, $Q = 35J$. If $W = -13J$ for the curved return path fI, Q for this path is



A. $33j$

B. $23j$

C. $-7j$

D. $-43j$

Answer: D

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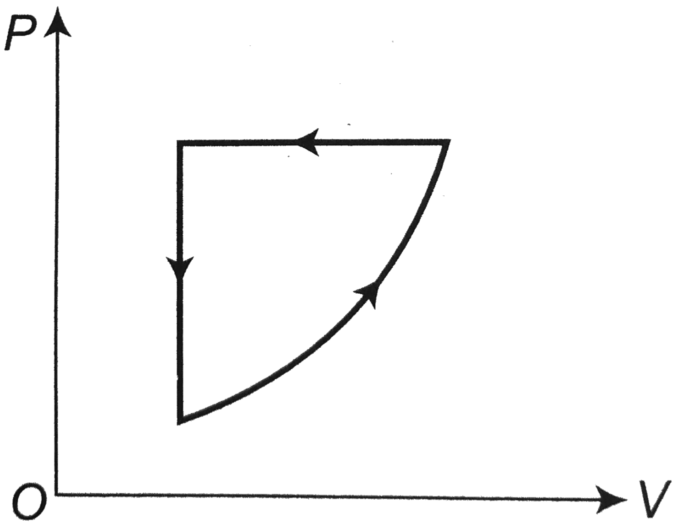
34. For one complete cycle of a thermodynamic process gas as shown in the P-V diagram, which of following correct?



A. $\Delta E_{\text{int}} = 0, Q > O$

B. $\Delta E_{\text{int}} = 0, Q < O$

C. $\Delta E_{\text{int}} > 0, Q < O$

D. $\Delta E_{\text{int}} < 0, Q > O$

Answer: A

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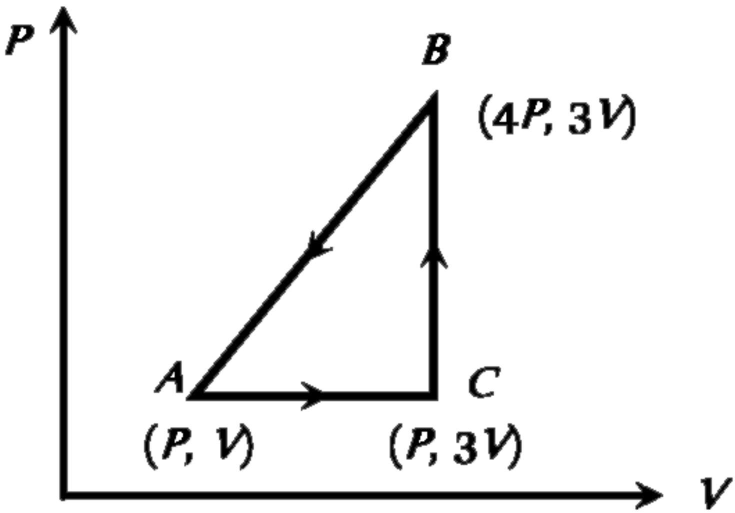
35. An ideal gas is taken around ABCA as shown in the above P - V diagram. The work done during a cycle is



A. Zero

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

C. p PV

D. PV

Answer: D

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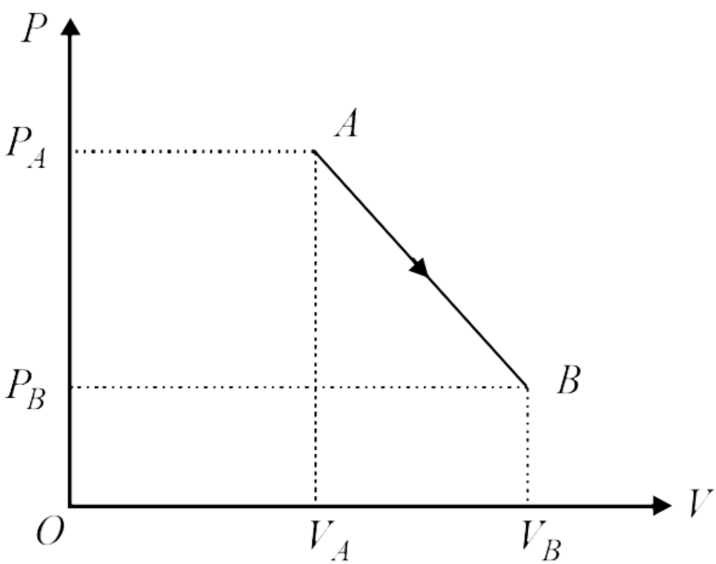
36. An ideal gas is taken from point A to the point B, as shown in the P-V diagram, keeping the temperature constant. The work done in the process is



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: D

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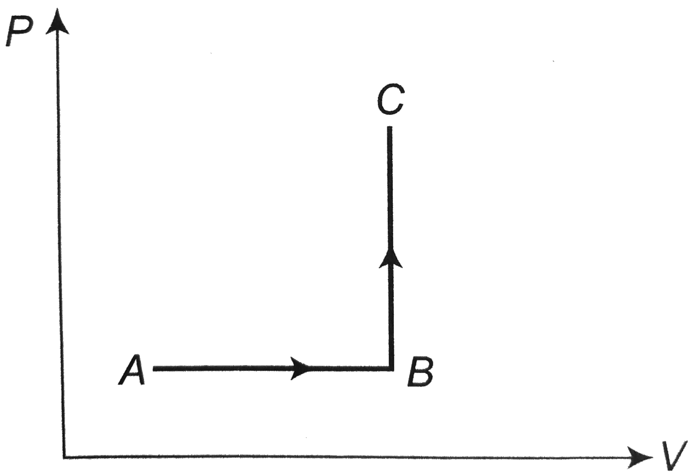
37. The $P - V$ diagram of a system undergoing thermodynamic transformation is shown in figure. The work done by the system in going from $A \to B \to C$ is $30J$ and $40J$ heat is given to the system. The change in internal energy between A and C is



A. $10j$

B. $70j$

C. $84j$

D. $134j$

Answer: A

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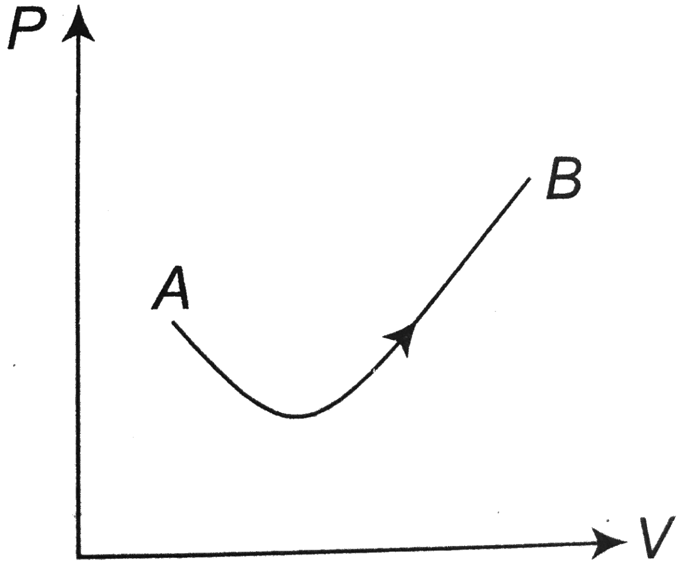
38. Consider a process shown in the figure. During this process the work done by the system



A. Continuously increases

B. Continuously decreases

C. First increases, then decreases

D. First decreases, then increases

Answer: A

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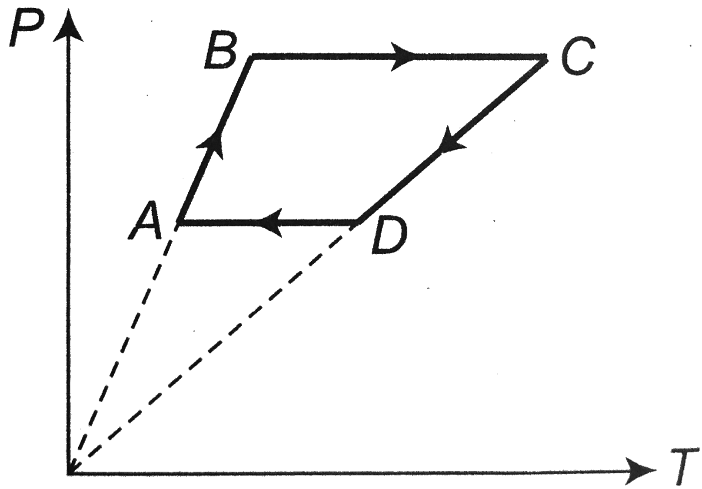
39. Six moles of an ideal gas performs a cycle shown in figure. If the temperature are $T_D = 600K,\ T_B = 800K,\ T_C = 2200K$ and

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



A. $20kj$

B. $30kj$

C. $40kj$

D. $60kj$

Answer: C

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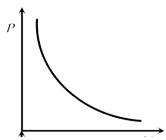
40. Which of the following $P-V$ diagrams best represents an isothermal process?

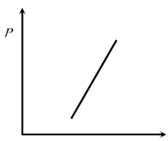
(a)

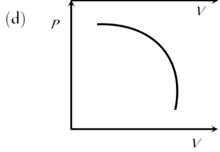
A.

(b)

B. 

(c)

C. 

D. 

Answer: B

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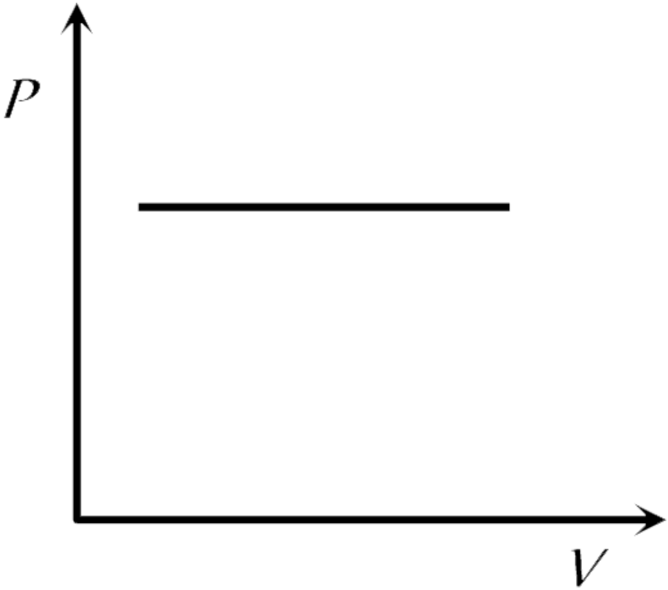
41. In the following figure, four curves A,B, C and D are shown. The curves are



A. Isothermal for A and D while adiabatic for B and C

B. Adiabatic for A and C while isothermal for B and D

C. Isothermal for A and B while adiabatic for C and D

D. Isothermal for A and C while adiabatic for B and D

Answer: D

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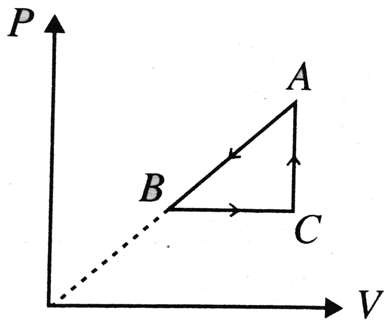
42. $P - V$ diagram of a cyclic process $ABCA$ is as shown in Fig. Choose the correct alternative



A. $\Delta Q_{A \rightarrow B} =$ negative

B. $\Delta U_{B \rightarrow C} =$ positive

C. $\Delta Q_{A \rightarrow B} =$ negative

D. All of these

Answer: D

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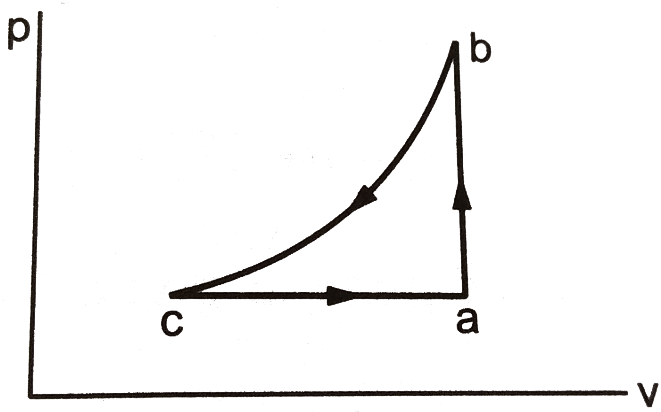
43. A sample of an ideal gas is taken through the cyclic process $abca$. It absorbs $50J$ of heat during the part ab, no heat during bc and rejects $70J$ of heat during ca. $40J$ of work is done on the gas during the part bc.

(a) Find the internal energy of the gas at b and c if it is $1500J$ at a.

(b) Calculate the work done by the gas during the part ca.



A. $1590j$

B. $1620j$

C. $1540j$

D. $1570j$

Answer: A

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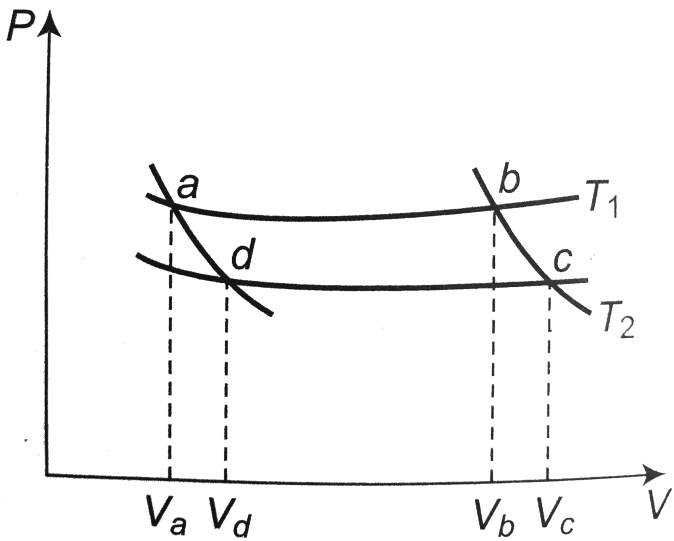
44. In the following P-V diagram two adiabatics cut two isothermals at temperature T_1 and T_2 (fig). The value of $\frac{V_a}{V_d}$ will be



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

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

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

D. $V_b V_e$

Answer: A

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Assertion Reason

1. Assertion: Reversible systems are difficult to find in real world.

Reason: Most processes are dissipative in nature.

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

B. If both assertion and reason are true but reason is not the correct explanation of t he assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false

Answer: A

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2. Assertion: Air quickly leaking out of a balloon becomes coolers.

Reason: The leaking air undergoes adiabatic expansion.

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

B. If both assertion and reason are true but reason is not the correct explanation of t he assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false

Answer: A

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3. Assertion: Thermodynamics process in nature are irreversible.

Reason: Dissipative effects cannot be eliminated.

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

B. If both assertion and reason are true but reason is not the correct explanation of t he assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false

Answer: A

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4. Assertion: When a bottle of cold carbonated drink is opened, a slight fog forms around the opening.

Reason: Adiabatic expansion of the gas causes lowering of temperature and condersation of water vapours.

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

B. If both assertion and reason are true but reason is not the correct explanation of t he assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false

Answer: A

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5. 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. If both assertion and reason are true and the reason is the correct explanation of the assertion.

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

t he assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: D

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

Reason: The adiabatic compression is a slow process.

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

B. If both assertion and reason are true but reason is not the correct explanation of t he assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false

Answer: D

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7. Assertion: In an isothermal process, whole of heat energy supplied to the body is converted into work.

Reason: According to first law of thermodynamics $\Delta Q = \Delta U + P\Delta V$

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

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

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: B

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8. Assertion : We can not change the temperature of a body without giving (or taking) heat to (or from) it. Reason : According to principle of conservation of energy, total energy of a system should remains conserved.

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

B. If both assertion and reason are true but reason is not the correct explanation of t he assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false

Answer: D

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9. 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. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of t he assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false

Answer: A

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10. Assertion : Work and heat are two equivalent form of energy. Reason : Work is the transfer of mechanical energy irrespective of temperature difference, whereas heat is the transfer of thermal energy because of temperature difference only.

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

B. If both assertion and reason are true but reason is not the correct explanation of t he assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false

Answer: A

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11. Assertion: The heat supplied to a system is always equal to the increase in its internal energy

Reason: when a system changes from one thermal equilibrium to another, some heat is absorbed by it.

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

B. If both assertion and reason are true but reason is not the correct explanation of t he assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false

Answer: D

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12. Assertion : A room can be cooled by opening the door of a refrigerator in a closed room. Reason : Heat flows from lower temperature (refrigerator) to higher temperature (room).

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

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

t he assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false

Answer: D

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13. 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. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of t he assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false

Answer: A

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14. Assertion : If an electric fan be switched on in a closed room, the air of the room will be cooled. Reason : Fan air decrease the temperature of the room.

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

B. If both assertion and reason are true but reason is not the correct explanation of t he assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false

Answer: D

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15. Assertion : The internal energy of an isothermal process does not change. Reason : The internal energy of a system depends only on pressure of the system.

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

B. If both assertion and reason are true but reason is not the correct explanation of t he assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false

Answer: C

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16. Statement-1 : In an adiabatic process, change in internal energy of a gas is equal to work done on/by the gas in the process.

Statement-2 : This is because temp.of gas remains constant in an adiabatic process.

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

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

t he assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false

Answer: C

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17. Assertion : An adiabatic process is an isoentropic process. Reason : Change in entropy is zero in case of adiabatic process

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

B. If both assertion and reason are true but reason is not the correct explanation of t he assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false

Answer: A

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18. StatementI: Work done by a gas in isothermal expansion is more than the work done by the gas in the same expansion adaibatically.

Statement II: Temperature remains constant in isothermal ecpansion but not in adiabatic expansion.

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

B. If both assertion and reason are true but reason is not the correct explanation of t he assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false

Answer: B

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19. Assertion : First law of thermodynamics is a restatement of the principle of conservation.

Reason : Energy is fundamental quantity.

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

B. If both assertion and reason are true but reason is not the correct explanation of t he assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false

Answer: C

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20. Assertion : Zeroth law of thermodynamic explain the concept of energy. Reason : Energy is dependent on temperature.

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

B. If both assertion and reason are true but reason is not the correct explanation of t he assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: D

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21. Assertion : Efficiency of a Carnot engine increase on reducing the temperature of sink.

Reason : The efficiency of a Carnot engine is defined as ratio of net mechanical work done per cycle by the gas to the amount of heat energy absorbed per cycle from the source.

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

B. If both assertion and reason are true but reason is not the correct explanation of t he assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false

Answer: B

Watch Video Solution

22. Assertion : The entropy of the solids is the highest Reason : Atoms of the solids are arranged in orderly manner.

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

B. If both assertion and reason are true but reason is not the correct explanation of t he assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false

Answer: A

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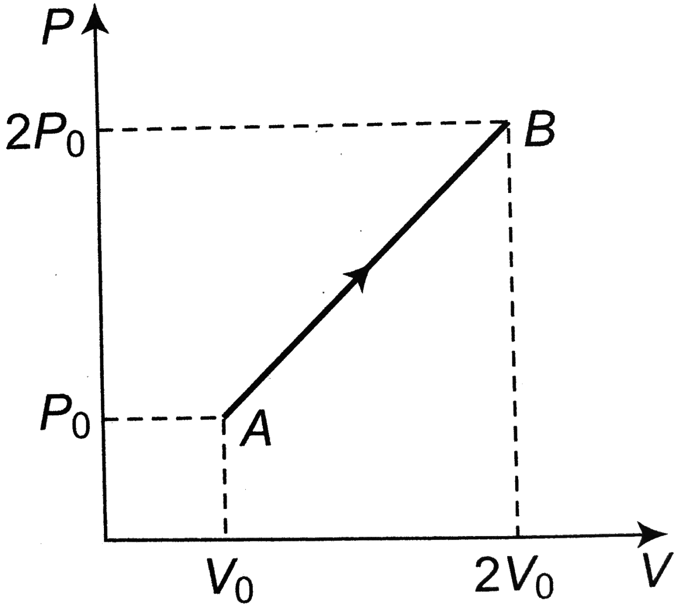
Set

1. The $P-V$ diagram of 2 gm of helium gas for a certain process $A \rightarrow B$ is shown in the figure. What is the heat given to the gas during the process $A \to B$?



A. $4P_0V_0$

B. $6P_0V_0$

C. $4.5P_0V_0$

D. $2P_0V_0$

Answer: B

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2. A certain mass of gas at 273 K is expanded to 81 times its volume under adiabatic condition. If $\lambda = 1.25$ for gas , then its final temperature is

A. $-235^\circ C$

B. $-182^\circ C$

C. $-91^\circ C$

D. $-0^{\circ}C$

Answer: B

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

A. $-90j$

B. $+90j$

C. 0 j

D. Depends on initial temperature

Answer: B

Watch Video Solution

4. If a Carnot's engine functions at source temperature $127^\circ C$ and at sink temperature $87^\circ C$, what is its efficiency

A. 0.1

B. 0.25

C. 0.4

D. 0.5

Answer: D

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5. In the case of diatomic gas, the heat given at constant pressure is that part of energy which is used for the expansion of gas, is

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

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

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

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

Answer: C

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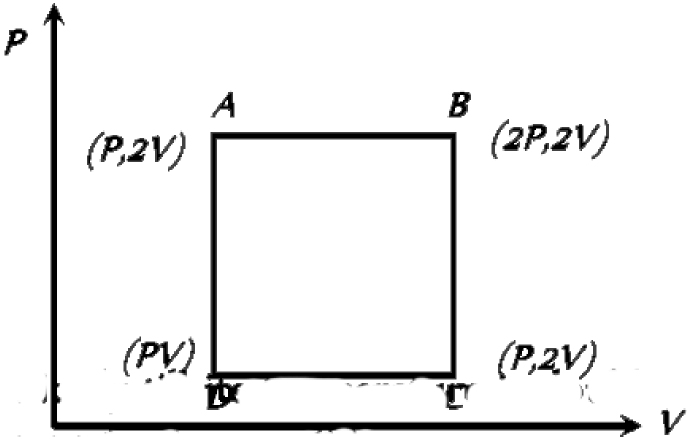
6. An ideal monoatomic gas is taken round the cycle ABCD A shown in the PV diagram in the given fig. The work done the cycle is



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

B. 2PV

C. PV

D. zero

Answer: C

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7. A gas is compressed adiabatically till its temperature is doubled. The ratio of its final volume to initial volume will be

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

B. more then $\frac{1}{2}$

C. less then $\frac{1}{2}$

D. Between 1 and 2

Answer: C

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8. A tyre filled with air,$(27^{\circ} C$,o and 2 atm) bursts, then what is temperature of air $(\lambda = 1.5)$

A. $-33^{\circ} C$

B. $0^{\circ} C$

C. $27^{\circ} C$

D. $240^{\circ} C$

Answer: A

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9. 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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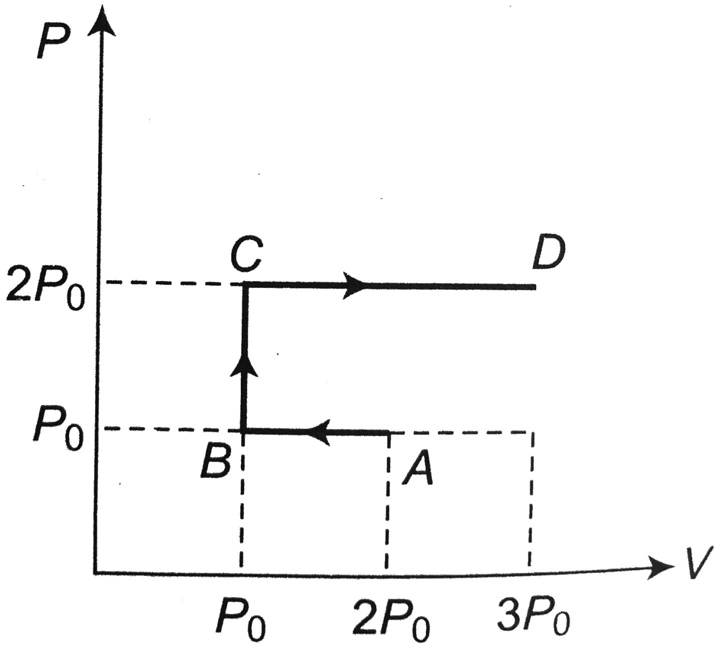
10. $P-V$ diagram of an ideal gas is as shown in figure. Work done by the gas in process

$ABCD$ is



A. $4P_0V_0$

B. $2P_0V_0$

C. $3P_0V_0$

D. P_0V_0

Answer: C

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11. An engineer claims to have made an engine delivering 10 kW power with fuel consumption of $1gs^{-1}$. The calorific value of fuel is 2 k cal / g . His claim

A. Is non-valid

B. Is valid

C. Depends on engine

D. Depends on load

Answer: A

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12. An ideal gas heat engine operates in a Carnot cycle between $27^\circ C$ and $127^\circ C$. It absorbs $6kcal$ at the higher temperature. The amount of heat (in kcal) converted into work is equal to

A. 3.5

B. 1.6

C. 1.2

D. 4.8

Answer: C

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13. A gas expands with temperature according to the relation $V = kT^{2/3}$. What is the work done when the temperature changes by $30^{\circ}C$?

A. 10 R

B. 20 R

C. 30 R

D. 40 R

Answer: B

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14. An ideal gas $(lm \text{ and } a = 1.5)$ is expanded adiabatically. How many times has the gas to be expanded to reduce the root mean square velocity of molecules 2.0 times

A. 4 times

B. 16 times

C. 8 times

D. 2 times

Answer: B

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15. Three samples of the same gas A,B and C $(\gamma = 3/2)$ have initially equal volume. Now the volume of each sample is doubled. The process is adiabatic for A. Isobaric for B and isothermal for C. If the final pressures are equal for all three samples, find the ratio of their initial pressures

A. $2\sqrt{2} : 2 : 1$

B. $2\sqrt{2} : 1 : 2$

C. $\sqrt{2}1 : 2$

D. $2:1\sqrt{2}$

Answer: B

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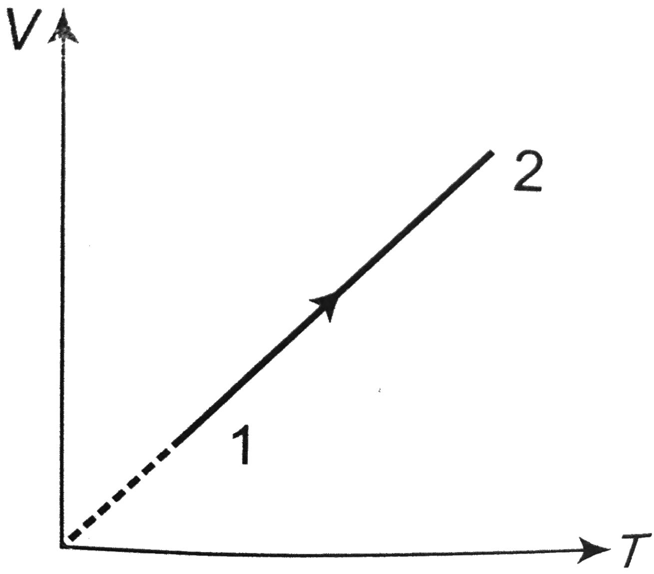
16. Volume versus temperature graph of two moles of helium gas is as shown in figure. The ratio of heat absorbed and the work done by the gas in process $1 - 2$ is



A. 3

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

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

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

Answer: B

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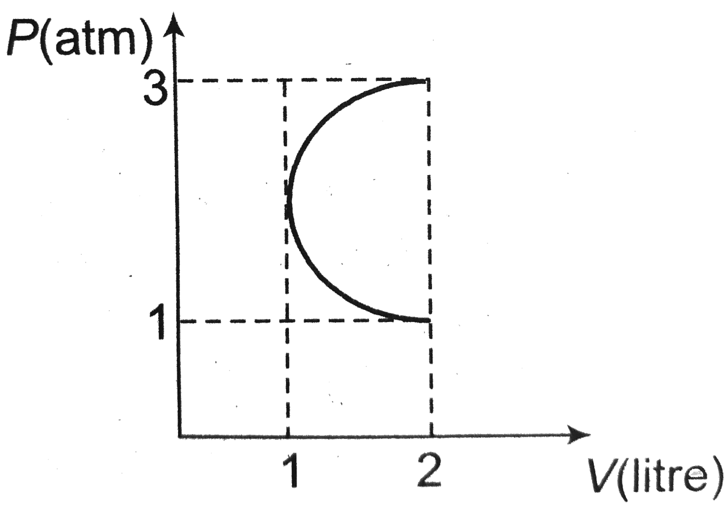
17. In the $P-V$ diagram shown in figure ABC is a semicircle. The work done in the process ABC is



A. Zero

B. $\frac{\pi}{2} atm - lt$

C. $-\frac{\pi}{2} atm - lt$

D. 4 atm-lt

Answer: B

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18. Heat is supplied to a diatomic gas at constant pressure.

The ratio of $\Delta Q : \Delta U : \Delta W$ is

A. $5:3:2$

B. $5:2:3$

C. $7:5:2$

D. $7:2:5$

Answer: C

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19. A gas undergoes a change of state during which 100J of heat is supplied to it and it does 20J of work. The system is brough back to its original state through a process during which 20 J of heat is released by the gas. What is the work done by the gas in the second process?

A. $60J$

B. $40J$

C. $80J$

D. $20J$

Answer: A

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20. N moles of an ideal diatomic gas are in a cylinder at temperature T. suppose on supplying heat to the gas, its temperature remain constant but n moles get dissociated into atoms. Heat supplied to the gas is

A. zERO

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

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

D. $\frac{3}{2}(N-n)RT$

Answer: B

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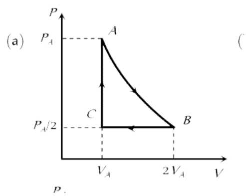
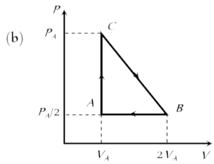
21. Three moles of an ideal gas $\left(C_p = \frac{7}{2}R\right)$ at pressure, P_A and temperature T_A is isothermally expanded to twice its initial volume. It is then compressed at constant pressure to its original volume. Finally gas is compressed at constant volume to its original pressure P_A.

(a) Sketch P-V and P-T diagrams for the complete process.

(b) Calculate the net work done by the gas, and net heat supplied to the gas during the complete process.

A. 

B. $\vec{V}$ 

C.

D.

Answer: A

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22. A cylinder of mass 1 kg is given heat of 20000 J at atmospheric pressure. If initially temperature of cylinder is $20^{\circ}C$ then work done by the cylinder will be (Given that Specific heat of cylinder = 400 J k g –1, Coefficient of volume expansion $9 \times 10 \quad {}^{\circ}C$ Atmospheric pressure =10 N/m and density of cylinder 9000 kg/m

A. 0.02 j

B. 0.05 j

C. 0.08 j

D. 0.1 j

Answer: B

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23. In a thermodynamic process pressure of a fixed mass of a gas is changed in such a manner that the gas releases 30 joules of heat and 10 joules of work was done on the gas. If the initial internal energy of the gas was 30 joules , then the final internal energy will be

A. 2 j

B. -18 j

C. $10j$

D. $58j$

Answer: C

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24. In an adiabatic change, the pressure and temperature of a monoatomic gas are related with relation as $P \propto T^C$, Where C is equal to:

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25. The internal energy of an ideal gas increases during an isothermal process when the gas is

A. Expanded by adding more molecules to it

B. Expanded by adding more heat to it

C. Expanded against zero pressure

D. Compressed by doing work on it

Answer: A

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Others

1. First law of thermnodynamics is given by

A. $dQ = dU + PdV$

B. $dQ = dU \times PdV$

C. $dQ = (dU + dV)P$

D. $dQ = PdV + dV$

Answer: A

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2. The internal energy of an ideal gas depends upon

A. specific volume

B. pressure

C. Temerature

D. Density

Answer: C

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3. 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. $\dfrac{Q-W}{2}$

Answer: B

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4. Heat given to a system is 35 joules and work done by the system is 15 joules. The change in the internal energy of the system will be

A. $-50j$

B. 20j

C. 30 j

D. 50j

Answer: B

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

A. Decrease

B. Increase

C. Remains constant

D. Depends on the molecular motion

Answer: C

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

A. momentum

B. Energy

C. Mass

D. Temperature

Answer: B

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7. A thermodynamic system goes from states (i) P_1V to $2P_1$, V (ii) P , V to P , 2 V . Then work done in the two cases is

A. Zero zero

B. Zero, PV

C. PV_1,Zero

D. PV_1, PV

Answer: B

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

A. $-50J$

B. $20J$

C. $30J$

D. $50J$

Answer: D

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9. A system is given 300 calories of heat and it does 600 joules of work. How much does the internal energy of the system change in this process (j=4.18joules/cal)

A. 654joule

B. 156.5joule

C. -300joule

D. -528.2joule

Answer: A

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

A. Initial state only

B. final state only

C. Both state and final states only

D. Intial state, final state and the path

Answer: D

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

A. 100 R

B. 150 R

C. 300 R

D. 500R

Answer: C

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12. 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. $7900J$

B. $8200J$

C. $5600J$

D. $6400J$

Answer: A

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13. A system performs work ΔW when an amount of heat is ΔQ added to the system, the corresponding change in the internal energy is ΔU . A unique function of the initial and final states (irrespective of the mode of change) is

A. ΔQ

B. ΔW

C. $\Delta U$and ΔU

D. ΔU

Answer: D

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14. A container of volume $1m^3$ is divided into two equal compartments by a partition. One of these compartments contains an ideal gas at 300 K . The other compartment is vacuum. The whole system is thermally isolated from its surroundings. The partition is removed and the gas expands to occupy the whole volume of the container. Its temperature now would be

A. 300 k

B. 239 k

C. 200 k

D. 100 k

Answer: A

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15. 110 J of heat is added to a gaseous system, whose internal energy change is 40 j. then the amount of external work done is

A. $150j$

B. $70j$

C. $110j$

D. $40j$

Answer: B

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16. Which of the following is not thermodynamical function

A. Enthalpy

B. Work done

C. Gibb's energy

D. Internal energy

Answer: C

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17. When the amount of work done is 333 cal and change in internal energy is 167 cal , then the heat supplied is

A. 166 cal

B. 333 cal

C. 500 cal

D. 400 cal

Answer: C

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18. First law of thermodynamics states that

A. System can do work

B. System has temperature

C. System has pressure

D. Heat is a from of energy

Answer: D

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19. A thermo-dynamical system is changed from state) ,(P_1, V_1) to (P_2, V_2) by two different process. The quantity which will remain same will be

A. ΔQ

B. ΔW

C. $\Delta Q$and ΔW

D. $\Delta Q - \Delta W$

Answer: D

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20. In thermodynamic process, 200 Joules of heat is given to a gas and 100 Joules of work is also done on it. The change in internal energy of the gas is

A. $100j$

B. $300j$

C. $419j$

D. $24j$

Answer: B

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21. A perfect gas contained in a cylinder is kept in vacuum. If the cylinder suddenly bursts, then the temperature of the gas

A. Remains constant

B. Become zero

C. Increase

D. Decrease

Answer: A

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22. If 150 J of heat is added to a system and the work done by the system is 110 j. then change in internal energy wil be

A. $260j$

B. $150j$

C. $110j$

D. $40j$

Answer: D

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23. If $\Delta Q$and ` represent the heat supplied to the system and the work done on the system respectively, then the first law of thermodynamics can be written as

A. $\Delta Q = \Delta U + \Delta W$

B. $\Delta Q = \Delta U - \Delta W$

C. $\Delta Q = \Delta W - \Delta U$

D. $\Delta Q = \Delta W + \Delta U$

Answer: B

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24. For free expansion of the gas which of the following is true

A. $\Delta W, \Delta Q$ and $\Delta E_{\int} = E$

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

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

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

Answer: A

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

A. Pressure and volume

B. Volume and temperature

C. Temperature and pressure

D. Any one of pressure, volume or temperature

Answer: D

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26. Which of the following is not a thermodynamics co-ordinate

A. P

B. T

C. V

D. R

Answer: D

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27. In a given process for 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 increase

Answer: A

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28. 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}

D. 5×10^{3}cal

Answer: B

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

A. Volume

B. Temperature

C. Pressure

D. Work

Answer: D

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

A. Kinetic energy only

B. inetic and potential energy

C. Potential energy

D. None of these

Answer: A

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

A. The internal energy changes in all processes

B. Internal energy and entropy are state functions

C. The change in entropy can never be zero

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

Answer: B

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32. A system is provided with 200 cal of heat and the work done by the system on the surrounding is 40 j. Then its internal energy

A. Increases by 600 J

B. Decreases by 800

C. Increases by 800 J

D. Decreases by 5j

Answer: A

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33. In thermodynamic process, pressure of a fixed mass of a gas is changes in such a manner that the gas molecules gives out 20 J of heat and 10 J of work is done in the gas. If the initial internal energy of the gas was 40 J, then the final internal energy will be

A. 30j

B. 20j

C. 60j

D. 40j

Answer: A

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34. Heat is not being exchanged in a body. If its internal energy is increased, then

A. Its temperature will increase

B. Its temperature will decrease

C. Its temperature will remain constant

D. None of these

Answer: A

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35. Out of the following which quantity does not depend on path

A. Temperature

B. Energy

C. Work

D. Nome of these

Answer: A

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36. First law of thermodynamics is a special case of

A. Newton's law

B. Law of conservation of energy

C. Charle's law

D. Law of heat exchange

Answer: B

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37. One mole of an ideal monoatomic gas is heated at a constant pressure of one atmosphere from 0° to $100^\circ C$. Then the change in the internal energy is

A. 6.56joules

B. 8.32×10^2joules

C. 12.48×10^2joules

D. $20.80 jo\underline{e}s$

Answer: C

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38. If the ratio of specific heat of a gas of constant pressure to that at constant volume is γ, the change in internal energy of the mass of gas, when the volume changes from V to $2V$ at constant pressure p is

A. $R(\lambda - 1)$

B. pV

C. $PV(\lambda - 1)$

D. $\lambda pV(\lambda - 1)$

Answer: C

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39. If $C_v = 4.96 cal / \mathrm{mole} K,$, then increase in internal energy when temperature of 2 moles of this gas is increased from 340 K to 342 K

A. 27.80 cal

B. 19.84 cal

C. 13.90 cal

D. 9.92 cal

Answer: B

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

A. Zeroth law of thermodynamics

B. First law of thermodynamics

C. Second law of thermodynamics

D. Newton's law of cooling

Answer: A

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

A. 45

B. 525

C. 975

D. Zero

Answer: C

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42. If heat given to a system is 6 kcal and work done is 6 k J . Then change in internal energy is

A. 19.1kj

B. 12.5kj

C. 25kj

D. Zero

Answer: A

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43. 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. 18j

B. 9j

C. 4.5j

D. 36j

Answer: A

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44. A monoatomic gas of n -moles is heated from temperature T to T under two different conditions (i) at constant volume and (ii) at constant pressure. The change in internal energy of the gas is

A. More for

B. More for (ii)

C. Same in both cases

D. Independent of number of moles

Answer: A

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45. The state of a thermodynamic system is represented by

A. Pressure only

B. Volume only

C. Pressure, volume and temperature

D. Number of moles

Answer: C

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46. A perfect gas goes from a state A to another state B by absorbing 8×105 J of heat and doing 6.5×105 J of external work. It is now transferred between the same two states in another process in which it absorbs 105 J of heat. In the second process

A. Wrok done on the gas $0.5 \times 10^5 j$

B. work done by gas is $0.5 \times 10^5 j$

C. work done on gas is $10^5 j$

D. Work done by gas is $10^5 j$

Answer: C

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

A. Zero

B. Negligible

C. Negative

D. positive

Answer: A

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

A. It introduces the concept of the internal energy

B. It introduces the concept of the entropy

C. It is not applicable to any cyclic process

D. None of the above

Answer: C

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