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PHYSICS

BOOKS - CHETANA PUBLICATION

Thermodynamics

Example

1. When a piece of ice is placed in water at room temperatur, ice melts and water cools down. Why does their temperture change?

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2. When water boils, why does its temperature remain constant?

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3. When an inflated ballon is suddenly burst,why is the emerging air slightly cooled?

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4. Describe the methods of heat transfer?

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5. What is thermodynamics and thermal equilibrium?

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6. Heat transfer occurs from which body to which body?

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7. Why different objects kept on table at room temperature do not exchange heat with the table?

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8. State Zeroth law of thermodynamics?

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9. State and explain Zero law of thermodynamics?

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10. Why is it necessary to make a physical contact between a thermocouple and the object for measuring its temperature?

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11. Define- Internal energy.

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12. Define- Heat.

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13. Define- Work.

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14. Calculate the internal energy of argon and oxygen.

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15. Calculate the internal energy of hydrogen and nitrogen.

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16. What is the thermodynamic system.

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17. What is Surroundings.

Watch Video Solution

18. What is Boundary.

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19. What are different types of systems?

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20. Explain the classification of systems.

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21. What is thermodynamic state?

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22. What is thermodynamic process?

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23. What is the sign convention used for energy transfer between the system and its environment?

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24. What is the sign convention used for workdone in case of system and its environment?

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25. Explain the transfer of energy between system and its environment.

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26. What is the relation between change in internal energy of the system and heat energy supplied to the system or heat extracted from the system?

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27. How are internal energy and work related?

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28. How is the change in internal energy brought about?

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29. Why is there a change in the energy of a gas when its volume changes?

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30. State first law of thermodynamics.

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31. What is positive work and negative work in thermodynamics.

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32. Derive an expression for work done for a system.

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33. State the relation between change in internal energy with work

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34. State the relation between change in internal energy with heat exchanged.

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35. Can you explain the thermodynamicsinvolved in cooking food using a pressure cooker?

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36. 1.0 kg of liquid water is boiled at $100^{\circ}C$ and all of it is converted to steam. If the change of state takes place at the atmospheric pressure $\left(1.01 \times 10^{5} Pa\right)$,calculate the energy transferredto the system.

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37. 1.0 kg of liquid water is boiled at $100^{\circ}C$ and all of it is converted to steam. If the change of state takes place at the atmospheric pressure $\left(1.01 \times 10^{5} Pa\right)$,calculate the change in the internal energy $ofthesystem.\ Given,\ thevolumeofwaterchan \geq som$ 1.0xx10^(-3)m^3 $\in liquidf$ or $m \rightarrow$ 1.671m^3` when in the form of steam.

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38. Can you explain how the work done by the system is utilized?

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39. Change in internal energy of the system can be positive, negative or zero. Explain.

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40. 104 kj of work is done on certain volume of a gas. If the gas releases 125 kj of heat, calculate the change in internal energy (in kj) of the gas.

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41. A system releases 125 kj of heat while 104 kj of work done on the system. Calculate the change in internal energy.

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42. A gas contained in a cyclinder fitted with a frictionless piston expands against a constant external pressure of 1 atm from a volume of 5 litres to a volume of 10 litres. In doing so it absorbs 400 J of thermal energy from its surrounding .Determine the change in internal energy of system.

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43. What are intensive and extensive variables?

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44. When is the system said to be in thermodynamical equilibirium?

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45. Explain property of a system or a system variable.

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46. What are macroscopic variables of a system?

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47. Write short notes on: Mechanical equilibirium

Watch Video Solution

48. Write short notes on: Chemical equilibirium

Watch Video Solution

49. Write short notes on: Thermal equilibirium

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50. How is thermodynamic equilibrium defined?

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51. What is equation of state?

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52. A mixture of hydrogen and oxygen is enclosed in a rigid insulated cyclinder. It is ignited by a spark. The temperature and the pressure both increase considerably. Assume that the

energy supplied by the spark is negligible, what conclusions may be drawn by application of the first law of thermodynamics?

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53. A resistor held in running water carries electric current. Treat the resistor as the system. Does heat flow into the resistor?

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54. A resistor held in running water carries electric current. Treat the resistor as the system. Is there a flow of heat into the water?

Watch Video Solution

55. A resistor held in running water carries electric current. Treat the resistor as the system. Assuming the state if resistance to remain unchanged, apply the first law of thermodynamics to this process.

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56. A mixture of fuel and oxygen is burned in a constant-volume chamber surrounded by a water bath. It was noticed that the temperature of water is increased during the process.Treating the mixture of fuel and oxygen as the system. Has heat been transferred?

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57. A mixture of fuel and oxygen is burned in a constant-volume chamber surrounded by a water bath. It was noticed that the temperature of water is increased during the process. Treating the mixture of fuel and oxygen as the system. Has work been done?

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58. A mixture of fuel and oxygen is burned in a constant-volume chamber surrounded by a water bath. It was noticed that the temperature of water is increased during the process. Treating the mixture of fuel and oxygen as the system. What is the sign of _U?

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59. What is indicator diagram?

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60. What is an Isotherm?

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61. Verify that the area under the p-V curve has dimensions of work.

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62. How is work done found using p-V diagram ?

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63. Draw a p-V diagram and explain the concept of positive and negative work. Give one example each.

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64. What is thermodynamic process?

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65. What happens in a thermodynamic process?

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66. What is reversible process?

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67. What is irreversible process?

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68. What is quasi-static process?

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69. Explain Reversible and Irresible process by p-V diagram.

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70. What are state dependent processes and path dependent processes?

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71. Explain work as a path function.

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72. Explain how heat added or removed from a system is a path function

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73. What are the assumptions for discussing thermodynamic processes?

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74. What do you mean by isothermal process?

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75. Explain thermodynamics of an Isothermal process

Watch Video Solution

76. Derive an expression for work done during an Isothermal process

Watch Video Solution

77. What is an Isotherm?

Watch Video Solution

78. Show that isothermal work is also given as Q=W = nRTln $\frac{Vf}{Vi}$

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79. 0.5 mole of gas at temperature 300 K expands isothermally from an initial volume of 2.0L to final volume of 6.0L. What is the work done by the gas ? $\left(R = 8.31 Jmol^{-1}K^{-(1)}\right.$

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80. 0.5 mole of gas at temperature 300 K expands isothermally from an initial volume of 2.0L to final volume of 6.1L. How much heat is supplied to the gas?.

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81. An ideal gas is taken through an isothermal process. If it does 2000 J of work on its environment, how much heat is added to it?

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82. What is an isobaric process?

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83. How do you find work done, heat transferred and the change in internal energy for an isobaric process?

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84. One mole of an ideal gas is initially kept in a cylinder with a movable frictionless and massless piston at pressure of $0.1mPa$ and temperature $27^\circ C$. It is then expanded till its volume is doubled. How much work is done if the expansion is isobaric ?

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85. What do you mean by Isochoric process?

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86. Explain the thermodynamics of Isochoric process?

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87. What is adiabatic process?

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88. State the equation for adiabatic process.

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89. Derive expression for work done during adiabatic process?

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90. An ideal gas of volume 1.0L is adiabatically compressed to $\frac{1}{15}th$ of its initial volume. Its initial pressure and temperature is $1.01 \times 10^5 Pa$ and $275^\circ C$ respectively. Given Cv for ideal gas = 20.8J/mol.K and γ = 1.4. Calculate final pressure.

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91. An ideal gas of volume 1.0L is adiabatically compressed to $\frac{1}{15}\Big)th$ of its initial volume. Its initial pressure and temperature is 1.01×10^5 Pa and $275^\circ Crespectively. GivenCvf$ or $idealgas = 20.8\frac{J}{m}ol.K$ and gamma` = 1.4. Calculate final temperature

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92. An ideal gas of volume 1.0L is adiabatically compressed to $\frac{1}{15}\Big)th$ of its initial volume. Its initial pressure and temperature is 1.01×10^5 Pa and $275^\circ Crespectively. GivenCvf$ or $idealgas = 20.8\frac{J}{m}ol.K$ and gamma` = 1.4. Calculate final temperature

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93. An ideal gas of volume 1.0L is adiabatically compressed to $\frac{1}{15}\Big)th$ of its initial volume. Its initial pressure and temperature is 1.01×10^5 Pa and $275^\circ Crespectively. GivenCvf$ or $idealgas = 20.8\frac{J}{m}ol.K$ and gamma` = 1.4. How would your answers change, if the process were isothermal?

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94. An ideal monatomic gas is adiabatically compressed so that itsfinal temperature is twice its initial temperature. What is the ratio of the final pressure to itsinitial pressure?

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95. Why is p-V curve for adiabatic process steeper than that for isothermal process?

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96. Explain formation of clouds at high altitude.

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97. When the temperature of a system is incresed or decreased in an adiabatic heating or cooling , is there any transfer of heat to the system or from the system ?

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98. A gas contained in a cylinder surrounded by a thick layer of insulating material is quickly compressed. Has there been a transfer of heat?

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99. A gas contained in a cylinder surrounded by a thick layer of insulating material is quickly compressed. Has work been done?

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100. Give an example of some familiar process in which no heat is added to or removed form a system,but the temperature of the system changes.

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101. Give an example of some familiar process in which heat is added to an object , without changing its temperature .

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102. What do you understand by cyclic process?

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103. A solar cooker and a pressure cooker both are used to cook food. Treating them as thermodynamic system, discuss the similarities and differences between them.

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104. In cyclic processes, when is the work done positive or negative?

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105. A system is taken to its final state from initial state in hypothetical paths as shown in the figure. Calculate the work done in each case.

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106. An engine works at 5000 RPM and it performs 1000 J of work in one cycle. If the engine runs for 10 min, how much total work is done by the engine?

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107. How would you interpret the $Q = W$ for a cyclic process ?

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108. Write a note on free expansion

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109. What are heat engines?

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110. What is a reservoir?

Watch Video Solution

111. What are the different elements of heat engine.

Watch Video Solution

112. Describe different elements of heat engine.

Watch Video Solution

113. Classify heat engine based on working substance.

Watch Video Solution

114. Explain the working of a heat engine.

Watch Video Solution

115. What is the thermal efficiency of a heat engine?

Watch Video Solution

116. Explain heat engine cycle with help of p-V diagram?

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117. How do refrigerators work?

Watch Video Solution

118. Explain how heat flow from colder region to a hotter region occur?

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119. Explain the schematic diagram for transferring heat from cold region to hot region.

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120. Explain the schematics of a refrigerator.

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121. Explain the working of a refrigerator with energy flow diagram?

Watch Video Solution

122. Explain the working of a refrigerator with energy flow diagram?

Watch Video Solution

123. What are the steps in one cycle of refrigeration.

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124. Explain coefficient of performance of a refrigerator.

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125. What is an air conditioner? Explain working and coefficient of performance of an air conditioner?

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126. Explain a heat pump.

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127. What are the limitations of 1st law of thermodynamics.

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128. What is the second law of thermodynamics ?

Watch Video Solution

129. What sets the limits on efficiency of a heat engine?

Watch Video Solution

130. Whatsetsthelimiton performanceof refrigerator/ air conditioner/heat pump.

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131. What is Carnot cycle?

Watch Video Solution

132. What is an ideal heat engine?

Watch Video Solution

133. What is Camot engine?

Watch Video Solution

134. Why should a Carnot cycle have two isothermal two adiabatic processes?

Watch Video Solution

135. Suggest a practical way to increase the efficiency of a heat engine.

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136. Explain Carnot refrigerator?

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137. A Carnot engine receives 2.0 kj of heat from a reservoir at 500 K, does some work, and rejects some heat to a reservoir at 350 K. How much work does it do?

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138. A Carnot engine receives 2.0 kj of heat from a reservoir at 500 K, does some work, and rejects some heat to a reservoir at 351 K. How much heat is rejected.

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139. A Carnot engine receives 2.0 kj of heat from a reservoir at 500 K, does some work, and rejects some heat to a reservoir at 352 K. What is its efficiency?

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140. Efficiency of a Carnot cycle is $75\,\%$ .If temperature of the hot reservoir is $727^{\circ}C$, calculate the temperature of the cold reservoir.

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141. A Carnot refrigerator operates between $250^\circ K$ and $300^\circ K$. Calculate its coefficient of performance.

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142. Explain sterling cycle?

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143. Where issterling cycle used?

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144. Distinguish between Reversible and Irreversible process.

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145. Distinguish between Heat pump and Refrigerator.

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Exercise

1. A gas initially at $17^{\circ}C$ issuddenly compressed to 1/8 of its original volume. Find the temperature after compression ? [gamma $= \frac{5}{3}$]

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2. A gas expands from 75 litres to 125 litres at constant pressure of 4 atmosphere. Find the work done by the gas during this expansion.

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3. When the temperature of 5 mol of a gas is changed from $100^\circ C$ to $120^\circ C$ keeping the volume constant, the change in internal energy of the gas is 80 J, then find the heat capacity of the gas at constant volume.

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4. 5 mol of oxygen is heated at constant volume from $10^\circ C$ to $20^\circ C$. Find the change in internal energy of the gas

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5. An amount of heat of 100 cal is supplied to a gas. The work done by the gas is 210 J. Find the increase in internal energy.

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6. 400 J of work is performed on a gasfor reducing its volume by compression. If the change is done adiabatically, whatisthe amount of heat absorbed by it?

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7. A cylinder contains one gram mole of H_2 at $17^\circ C$ and 2 atms. The initial volume of the gas is $2 \times 10(- 3)m^3$. Find the

work done if its volume changes by 15 percent.

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8. In a thermodynamic process 400 J of heat is given to a gas and 100 J of work is also done on it. Find the change in the internal energy of the gas.

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9. If 5 moles of oxygen at STP is adiabatically compressed so that temperature increases to $400^{\circ}C$, then find the work done on the gas. R=8.3J/mole-K

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10. 70 calories of heat is required to raise the temperature 2 moles of an ideal gas at constant pressure from $30^{\circ} C$ to $35^{\circ} C$. What is the amount of heat required to raise the temperature of the same gas from $30^{\circ} C$ to $35^{\circ} C$ at constant volume?

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11. If 1200 calories of heat is removed from a gas which is held at constant volume, what is the change in internal energy of the system?

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12. The volume of 1 kilomole of an ideal gas increases isothermally from 1 litre to 10 litres at $27^{\circ} C$. If the universal

gas constant is 8312 $Jkmol^{-1}K^{-1}$, calculate the work done.

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13. Work done for the rise of one mole of helium gas adiabatically through $2^{\circ}C$ is W. What is the work done for the rise of one mole of hydrogen gas adiabatically through $2^{\circ}C$?

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14. A diatomic gas at pressure P and volume V is compressed adiabatically to $\frac{1}{32}$ times the original volume. Find the final pressure.

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15. During an adiabatic process, if the pressure of an ideal gas is proportional to the cube of its temperature, find f value.

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16. Calculate the efficiency of a Carnot's engine working between steam point and ice point.

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17. A Carnot engine takes in 1000 k cal of heat from a reservoir at $627^\circ C$ and exhausts heat to sink at $27^\circ C$. What is the efficiency?

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18. A Carnot engine whose low temperature reservoir is at $7^{\circ} C$ has an efficiency of 40. It is desired to increase the efficiency to 50%. By how many degree must the temperature of the high temperature reservoir be increased?

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19. A refrigerator has to transfer an average of 263 J of heat per second from temperature $(-10)^{\circ} C$ to $25^{\circ} C$. Calculate the average power consumed assuming ideal reversible cycle and no other losses.

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20. Refrigerator A works between $(-10)^{\circ}C$ and $27^{\circ}C$ while refrigerator B works between $-20^{\circ}C$ and $17^{\circ}C$, both removing heat equal to 2000 J from the freezer. Which of the two is the better refrigerator?

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21. For a given amount of gas at a given temperature when volume is ten folded isothermally, the work done is x. What is the work done for the same amount of gas at the same temperature, if the volume is hundred folded?

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22. Thermal equilibrium implies the equality of

A. energy

B. internal energy

C. kinetic energy

D. temperature

Answer:

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

A. temperature

B. kinetic energy

C. total energy

D. internal energy

Answer:

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24. A quantity of heat Q issupplied to a monoatomic ideal gas, which expands at constant pressure. The fraction of heat that goes into work done by the gasis

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

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

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

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

Answer:

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25. An adiabatic process occurs at constant

A. temperature

B. pressure

C. heat

D. temperature and pressure

Answer:

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26. In an adiabatic expansion of a gas

A. heat is gained or lost

B. heat is neither gained nor lost

C. temperature is kept adiabatically

D. volume is kept constant

Answer:

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27. When a gas expands adiabatically

A. no energy is required for expansion

B. energy is required and it comesfrom the wall of the container of the gas

C. internal energy of the gasis used in doing the work

D. law of conservation of energy does not hold good

Answer:

Watch Video Solution

28. The pressure temperature relationship for an ideal gas undergoing adiabatic change is

A. $P^{1-\gamma}T^{\gamma}$ = constant

B. $P^{\gamma-1}T\gamma$ = constant

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

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

Answer:

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

A. increase by 400 J

B. decreases by 400 J

C. increases by 200 J

D. decreases by 200 J

Answer:

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30. Two samples A and B of a gas initially of the same temperature and pressure are compressed from a volume V to

a volume $\frac{V}{2}$ such that A is compressed isothermally and B adiabatically. The final pressure of

A. A is greater than that of B

B. A is equal to that of B

C. A is less than that of B

D. A is twice the pressure of B

Answer:

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31. A quantity of heat Q issupplied to a monoatomic ideal gas, which expands at constant pressure. The fraction of heat that goes into work done by the gasis

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

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

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

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

Answer:

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

A. $W_2 > W_3 > W_1$

B. $W_1 > W_2 > W_3$

C. $W_1 > W_3 > W_2$

D. $W_2 > W_1 > W_3$

Answer:

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33. An ideal gas A and a real gas B have their volumesincreased fromV to2V under isothermal conditions. The increase in internal energy

A. will be same for 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:

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34. For a gas undergoing an adiabatic process, the relation between temperature and volume is found to be $TV^{\circ.4}$ = constant. The gas may be

A. argon

B. nitrogen

C. marsh gas

D. carbondioxide

Answer:

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35. The internal energy of a gas decreases by an amount equal to the external work, the gas is undergoing

A. adiabatic expansion

B. adiabatic compression

C. isothermal expansion

D. isochoric expansion

Answer:

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36. In a cyclic process

A. work done is zero

B. work is done by the system

C. work is done on the system

D. work done depends upon the quantity of heat given to the system or taken

Answer:

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37. $\delta Q = \delta U$ is true for

A. isochoric process

B. adiabatic process

C. isothermal process

D. isobaric process

Answer:

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38. For isothermal expansion of perfect gas, the value of $\delta a(P)(P)$ is equal to

A. $\left(-\gamma^{1.2}\right)\left[\frac{\delta V}{V}\right]$

B. $\left[-\frac{\delta V}{V}\right]$

C. $\left(-\gamma[(\delta V V)]\right.$

D. $\gamma^2[\text{ frac }(\delta V V)]$

Answer:

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39. Four curves A, B, Cand Dare drawn in the figure for a given amount of gas. The curves which represent adiabatic and isothermal changes are

A. C and D respectively

B. D and C respectively

C. A and B respectively

D. B and A respectively

Answer: dia

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40. A given mass of a gas expands from state A to state B by three paths 1, 2 and 3 as shown in the figure. If W_1, W_2 and W_3 respectively are the work done by the gas along the three paths, then. br> 

A. $W_1 > W_2 < W_3$

B. $W_1 < W_2 < W_3$

C. $W_1 = W_2 = W_3$

D. W1 = W2 > W3

Answer:

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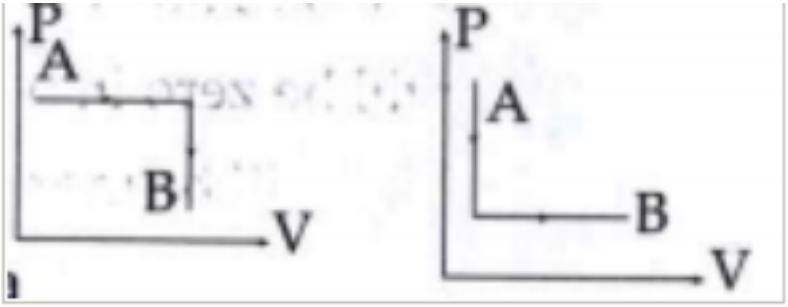
41. If w_1 and w_2 are the amounts of work done in the given two indicator diagrams, then br>



A. $w_1 > w_2$

B. $w_2 > w_1$

C. $w_1 = w_2$

D. insufficient data

Answer:

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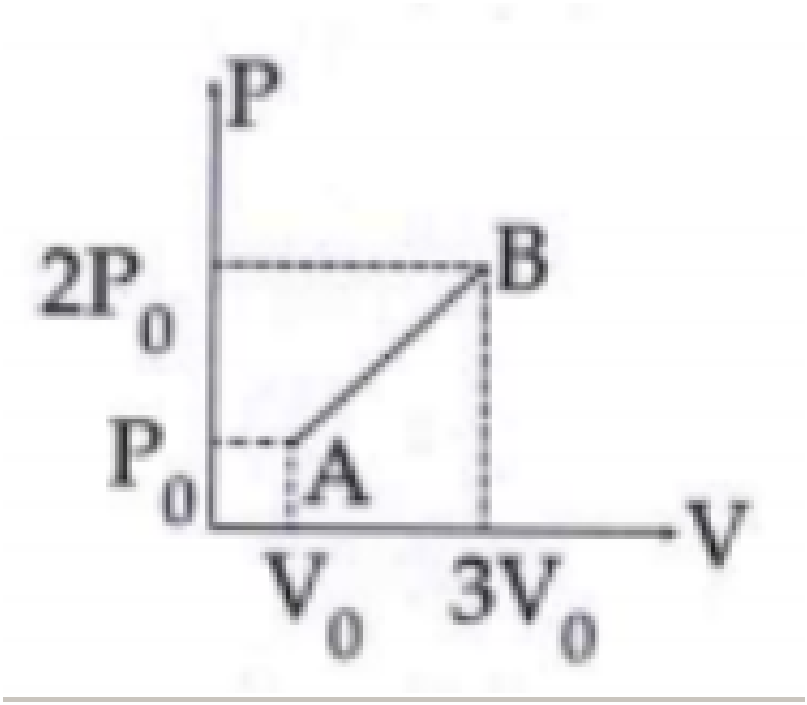
42. In the indicator diagram shown, the work done along the path AB is br>



A. zero

B. 45 J

C. 90 J

D. 30 J

Answer:

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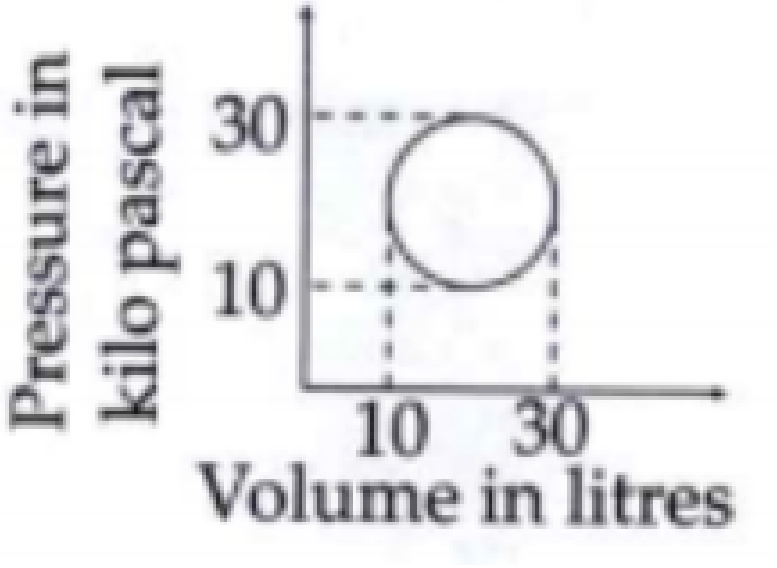
43. In the indicator diagram shown, the work done in the cyclic process is br>



A. $107\pi J$

B. $104\pi J$

C. $102\pi J$

D. $103\pi J$

Answer:

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44. The internal energy of air in a room of volume $40m^3$ atstandard atmospheric pressure is

A. $10^7 Joe$

B. $10^6 Joe$

C. $10^5 Joe$

D. $10^4 Joe$

Answer:

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

A. 60 J

B. 40 J

C. 80 J

D. 20 J

Answer:

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46. The amount of work done to increase the temperature of one mole of an ideal gas by $30^{\circ}C$, if it expands under the condition $V \propto T^{\frac{2}{3}}$ is

A. 60 cal

B. 136 J

C. 252 J

D. 168 J

Answer:

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47. Two engines A and B have their sources at 400 K and 350 K and sinks at 350 K and 300 K respectively. Which is more

efficient and by how much ?

A. 1.8%

B. 1.7%

C. 1.6%

D. 1.5%

Answer:

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48. If two thirds of the heat taken by a heat engine from the source is given to the sink, its efficiency is

A. 33.33%

B. 66.67%

C. $30\ \%$

D. $40\ \%$

Answer:

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49. The efficiency of a heat engine is $20\ \%$, when the working substance is hydrogen. Its efficiency if hydrogen is replaced by oxygen is

A. $20\ \%$

B. $40\ \%$

C. $60\ \%$

D. $80\ \%$

Answer:

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50. If the absolute temperatures of the source and sink of a heat engine are in the ratio $4:3$, its efficiency is

A. $25\ \%$

B. $33.33\ \%$

C. $13\ \%$

D. $20\ \%$

Answer:

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51. Two Carnot engines A and B are operated in series. A receives heat at 900 K and rejects it to the reservoir at TK. B receives the rejected heat from Aand rejectsit to itsreservoir at 400 K. If the work outputs of A and B are equal, then T is

A. 750 K

B. 700 K

C. 650 K

D. 600 K

Answer:

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52. A refrigerator has a coefficient of performance 9. If the surrounding temperature is $27^{\circ}C$, the minimum temperature

it can cool a body inside is

A. $(-20)^{\circ C}$

B. $(-13)^{\circ} C$

C. $(-7)^{\circ} C$

D. $(-3)^{\circ} C$

Answer:

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53. A refrigerator works between $0^{\circ} C$ and $27^{\circ} C$. If heat is to be removed from the refrigerated space at t/rate of 50 kcal/minute, the power of the motor of the refrigerator should be

A. 0.346 kW

B. 3.46 kW

C. 0.173 kW

D. 1.73 kW

Answer:

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54. A gas in a closed container is heated with 10 J of energy , causing the lid of the container to rise 2 m with 3 N of force. What is the total change in energy of the system ?

A. 10J

B. 4J

C. (-10)J

D. (-4)J

Answer:

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55. Which of the following is an example of the first law of thermodynamics ?

A. The specific heat of an object explains how easily it changestemperatures.

B. While melting, an ice cube remains at the same temperature.

C. When a refrigerator is unplugged, everything inside of it returns to room temperature after some time.

D. After falling down the hill, a ball's kinetic energy plus heat energy equals the initial potential energy

Answer:

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56. Efficiency of a Carnot engine is large when

A. TH islarge

B. TC islow

C. TH-TCis large

D. TH-TC is small

Answer:

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57. The second law of thermpdynamics deals with transfer of

A. work done

B. energy

C. momentum

D. heat

Answer:

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58. During refrigration cycle, heat is rejected by the refrigerant in the

A. condenser

B. cold chamber

C. evaporator

D. hot chamber

Answer:

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59. Select and write correct alternative from the following alternatives: The indicator diagrams representing maximum and minimum amounts of work done are respectively:

A. 3 and1

B. 1 and 3

C. 2 and 1

D. 4 and2

Answer:

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60. State first law of thermodynamics.

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61. Work done during expansion is positive. Explain.

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62. State zeroth law of thermo dynamics? OR Give the characteristics of isobaric process.

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63. Draw a neat labelled diagram to show the energy flow of heat engine.

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64. State both the statements of second law of thermodynamics.

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65. Mention the set of processesin a Carnot cycle.

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66. Distinguish between Reversible and Irreversible process.

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67. 5 mol of oxygen is heated at constant volume from $10^{\circ} C$ to $20^{\circ} C$. Find the change in internal energy of the gas

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68. An amount of heat of 100 cal is supplied to a gas. The work done by the gas is 210 J. Find the increase in internal energy.

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69. An ideal gasin a cylinder is compressed adiabatically to one-third its original volume. During the processif 45 J of work is done on the gas by the compressing agent, what is the change in internal energy?

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70. Derive an expression for efficiency of Carnot cycle.

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71. Derive an expression for work done in adiabatic process.

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72. Explain the working of a refrigerator with energy flow diagram?

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73. A Carnot engine absorbs 1000 J of heat from a reservoir at $127^\circ C$ and rejects 600 J of heat during each cycle.Calculatethe temperature of the sink

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74. A Carnot engine absorbs 1000 J of heat from a reservoir at $127^\circ C$ and rejects 600 J of heat during each cycle.Calculatethe amount of the useful work done during each cycle.

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75. What isthe process modification in sterling cycle compared to Carnot.

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76. what are the uses of sterling cycle.

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