CHEMISTRY

BOOKS - CHETANA PUBLICATION

Chemical Thermodynamics

Example

1. (a) How do you define energy, (b) What are different forms of energy

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2. What is thermodynamics ?

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3. State the limitation of thermodynamics.

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4. What are different types of systems?

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5. Define: (1) Open system (2) Closed system (3) Isolated system.

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6. Classify the following as open, closed or isolated system. (i) Animals and plants on the earth. (ii) Calorimeter. (iii) Thermos flask filled with hot tea. (iv) A tin containing Pepsi.

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7. What is the difference between extensive and intensive properties?

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8. What are intensive properties? Explain why density is intensive property.

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9. What are state variables?

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10. Define state of system and explain change of state.

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11. Define and Explain state function.

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12. What is path function?

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13. What is a process? What are different types of processes?

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14. Define and explain different types of processes.

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15. Write the features of reversible process.

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16. What are the ways of changing energy of a closed system?

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17. Explain unit of work and energy.

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18. Explain pressure-volume expansion work with the help of an example.

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19. Explain PV compression work with an example.

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20. Explain nature of heat in thermodynamics.

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21. Explain sign conventions of Q, W and ΔU.

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22. Derive an expression for work when gas expands against constant external pressure.

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23. Derive an expression for pressure-volume work.

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24. Derive the equation $W = -P_{ext}\Delta V$

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25. Comment on the statement: no work is involved in an expansion of gas in vacuum.

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26. A free expansion of a gas results into no work. Explain.

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27. Explain unit of work and energy.

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28. Explain the concept of maximum work.

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29. What are the conditions for maximum work?

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30. Derive an expression for maximum work.

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

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32. Explain concept of internal energy (U).

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33. Explain the concept of change in internal energy with examples

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34. 25 KJ work is done on the system and it releases 10 KJ of heat what is ΔU?

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35. State the first law of thermodynamics in different ways.

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36. Deduce mathematical equation of first law of thermodynamics for the following processes: Adiabatic process

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37. Deduce mathematical equation of first law of thermodynamics for the following processes: Isothermal process

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38. Deduce mathematical equation of first law of thermodynamics for the following processes: Adiabatic process

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39. Deduce mathematical equation of first law of thermodynamics for the following processes: Isochoric proecess

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40. Deduce mathematical equation of first law of thermodynamics for the following processes: Isobaric process

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41. Define and explain the term 'enthalpy'.

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42. Derive expression for enthalpy change.

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43. Prove that heat absorbed at constant pressure is nothing but change in enthalpy.

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44. Derive relation between ΔH and ΔU for chemical reactions.

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45. Derive relation $\Delta H = \Delta U + \Delta n_g RT$.

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46. Obtain the relationship between ΔH and ΔU for gas phase reactions.

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47. Derive expression for work done in a chemical reactions.

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48. How does the sign of W depends on ΔV?

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49. Under what conditions $\Delta H = \Delta U$?

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50. What is phase transition? Define : Enthalpy of fusion

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51. What is phase transition? Define : Enthalpy of vaporisation

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52. What is phase transition? Define : Enthalpy of sublimation

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53. Define: Enthalpy of ionization

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54. Define: Enthalpy of atomization

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55. Define: Enthalpy of solution

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56. Define: Enthalpy of dilution

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57. Define and Explain Enthalpy of solution.

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58. For KCl, $\Delta_L H = 699 kJ/mol^{-I}$ and $\Delta_{hyd} H = -681.8 kJ/mol^{-1}$. What will be its enthalpy of solution?

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59. What is thermometry ?

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60. Define and explain enthalpy of chemical reaction (heat of reaction).

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61. What are the factors affecting heat of reaction?

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62. Explain exothermic reaction with example.

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63. Explain endothermic reaction with example.

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64. Distinguish between exothermic and endothermic reaction

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65. What is standard enthalpy of reaction give example

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66. What is standard state of a substance?

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67. Write the rules for writing thermochemical equation.

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68. Given the thermochemical equation. $C_2H_2 + \frac{5}{2}O_2(g) \rightarrow 2CO_2(g) + H_2O(I)\Delta_r H^\circ$=-1300 kJ` Write thermochemical equations when (i) Coefficients of substances are multiplied by 2 (ii) Equation is reversed.

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69. Define and explain standard enthalpy of formation with example.

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70. Explain the step for calculation of standard enthalpy of reaction from standard enthalpy of formation.

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71. What is standard enthalpy of combustion? Give an example

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72. What is bond enthalpy. Given an example.

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73. Write equation for bond enthalpy of Cl - Cl bond in Cl_2 molecule ΔH° for dissociation Cl_2 molecule is 242.7 KJ

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74. Explain Average bond enthalpy with example.

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75. Explain average bond enthalpy in methane molecule.

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76. How will you calculate reaction enthalpy from data on bond enthalpies?

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77. State Hess's law of constant heat summation. Illustrate with an example state its application.

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78. What are spontaneous process. Give its example and important features.

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79. Energy is not only the criterion for spontaneity of reaction Explain.

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80. What is entropy. Give its unit.

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81. Explain how entropy changes in the following processes. Freezing of liquid

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82. Explain how entropy changes in the following processes. sublimation of solid

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83. Explain how entropy changes in the following processes. dissolving of sugar in water

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84. Explain how entropy changes in the following processes.condensation of vapour

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85. Explain what happens to entropy changes in: Dissolution of solid I_2 in water.

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86. Explain what happens to entropy changes in: Dissociation of H_2 molecule into atoms

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87. Give reasons: The dissolution of ammonium chloridein water is endothermic still it dissolves in water.

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88. Give reasons: A real crystal has more entropy than an ideal crystal.

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89. Explain the relationship between entropy and heat transfer at given temperature.

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90. Write a note on Quantitative aspect of entropy.

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91. Explain Entropy and spontaneity of the process, with examples.

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92. State second law of thermodynamics in the term of entropy.

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93. If the entropy change of a reaction is ΔS. How will you calculate entropy of its surroundings ?

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94. State whether ΔS is positive, negative or zero for the reaction $2H_g \rightarrow H_{2(g)}$. explain.

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95. What are the conditions for spontaneity with respect to total entropy.

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96. Define Gibb's energy and change in Gibb's energy

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97. Obtain the relation between ΔG and $\Delta S_{\rightarrow tal}$ Comment on Spontaneity of the reaction

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98. Obtain temperature condition for equilibrium.

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99. Obtain the relationship between $DelatG^{\circ}$ of a reaction and equilibrium constant.

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100. Three moles of an ideal gas are expanded isothermally from 15 dm^3 to 20 dm^3 at constant pressure of 1.2 bar. Estimate the amt of work in dm^3 bar J.

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101. Calculate the constant external pressure required to compress 2 moles of an ideal gas from volume of $25dm^3 \rightarrow 13dm^3$ when the work obtained is 4862.4 J.

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102. One mole of an ideal gas is compressed from 500 cm3 against a constant external pressure of 1.2×10^5 Pa The work involved in the process is 36.0 J. Calculate the final volume.

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103. Three moles of an ideal gas are expanded isothermally from a volume of $300cm^3$ to 2.5L at 300 K against a pressure of 1.9 atm. Calculate the work done in L atm and joules

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104. Calculate the work done when 5 moles of an W, ideal gas expanded from $1m^3 \rightarrow 10m^3$ against a constant external

pressure of $2.026 \times 10^2 Nm^{-2}$.

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105. 6 moles of ideal gas are expanded isothermally and reversibly from $20m^3$ to $40m^3$ at 300k. Calculate work done $\left(R = 8.314 Jk^{-1} mol^{-1}\right)$.

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106. 2 moles of an ideal gas are expanded isothermally and reversibly from 20 L to 30 L at 300K. Calculate the work done $\left(R = 8.314 JK^{-1} mol^{-1}\right)$

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107. 22 g of CO_2 are compressed isothermally and reversibly at 298 K frominitial pressure of 100 Kpa when the work obtained is 1.2 KJ. Find the final pressure.

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108. 300 m mol of an ideal gas occupies $13.7 dm^3 at 300 K$. Calculate the work done when the gas is expanded until its volume has increased by $2.3 dm^3$ (a) isothermally against a constant external pressure of 0.3 bar (b) isothermally and reversibly (c) into vaccum.

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109. Three moles of an ideal gas are compressed isothermally and reversibly to a volume of 2L. The work done is 2.983 kj at $22^{\circ}C$. Calculate the initial volume of the gas

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110. $2.8 \times 10^{-2} kg$ of nitrogen is expanded isothermally and reversibly at 300 K from $15.15 \times 10^{5} NM^{-2}$ when the work done is found to be -17.33 KJ Find the final pressure.

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111. Calculate the maximum work when 24 g of O_2 are expanded isothermally and reversibly from the pressure of 1.6 bar to1bar at 298 K.

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112. Calculate the work done in the decomposition of 132g of $NH_4NO_3 at 100^\circ C NH_4NO_{3(s)} \rightarrow N_2O + 2H_2O$ State whether work is done on the system or by the system.

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113. Calculate the work done during synthesis of NH_3 in which volume changes from $8dm^3$ to $4dm^3$ at a Constant external pressure of 43 bar. In what direction the work energy flows?

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114. Calculate the amount of work done in the: oxidation of1mole $HCl(g) at 200^\circ C$ according to reaction $4HCl(g) + O_2 \rightarrow 2Cl_2(g) + 2H_2O(g)$.

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115. Calculate the amount of work done in the :decomposition of 1mole of $NO at 300^\circ C$ for the reaction $2NO(g) \rightarrow N_2(g) + O_2(g)$

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116. Calculate the work done and comment on whether work is done on or by the system for the decomposition of 2 moles of $NH_4NO_3 at 100^\circ C\ NH_4NO_3(s) \rightarrow 2N_2O(g) + H_2O(g)$

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117. Calculate standard enthalpy of reaction `

$$2C_2H_{6(g)} + 7O_{2(g)} \rightarrow 4CO_{2(g)} + 6H_2O_{(l)}$$

Given that $\Delta_f H^\circ(CO_2) = -393.5 kJ/mol$

$\Delta_f H^\circ(H_2O) = -285.8\ kJ/mol$

$\Delta_f H^\circ(C_2H_6) = -84.9\ kJ/mol$ (2

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118. Estimate the std enthalpy of combustion of $CH_{4(g)}$. If $Delat_t H^\circ(CH_4)$ = $-78.4k\frac{j}{m}ol$ $\Delta_t H^\circ(CO_2)$ = - 393.5 kj/mol & $\Delta\Delta_t H^\circ(H_2O)$ = - 285.8kJ/mol

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119. ΔH for the reaction,$2C(s) + 3H_2(g) \rightarrow C_2H_6(g)$ is -84.4 kJ at $25^\circ C$. Calculate ΔU for the reaction at $25^\circ C$. (R = $8.314 JK^{-1}mol^{-1}$)

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120. Calculate the work done in oxidation of 4 m moles of SO_2 at $25^\circ C$ if $2SO_2(g) + 02(g) \rightarrow 2SO_2(g)$ R = $8.314 JK^{-1}mol^{-1}$ State whether work is done on the system or by the system.

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121. In a particular reaction 2kJ of heat is released by the system and 6kJ of work is done on the system. Determine ΔH and ΔU?

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122. Calculate ΔU at 298k for the reaction $C_2H_4(g) + HCl(g) \rightarrow$ C2H5Cl(g) DeltaH = -72.3kJ` How much PV work is done.

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123. The enthalpy changes for the reaction $C_2H_4(g) + H_2(g) \rightarrow C_2H_6(g)$ is -620J When 100ml of ethylene and 100ml of $H_2 reacts$ at 1 bar pressure. Calculate the pressure volume type of work and ΔU for the reaction

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124. Two moles of ideal g'as are expanded isothennally from a volume of 20.5 L to the volume of 25.5 L against a constant external pressure of 1atm. Calculate amount of work in L.atm and J (1L.atm =101.3J)

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125. Calculate the constant external pressure required to compress one mole of an ideal gas from a volume of 20 L to 8L when the Work obtained is 44.9L atm.

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126. 4.4×10^{-2} kg of CO_2 are compressed isothennally and reversibly at 293K from the initial pressure of 150 kPa when the

work obtained is 1.245kJ. Find the final pressure. $\left(R = 8.314 JK^{-1} mol^{-1}\right)$.

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127. 8.8×10^{-3} kg of CO_2 at 300 K are isothermally and reversibly compressed till the pressure is doubled. Calculate the maximum work assuming ideal behaviours for CO_2. (R = 8.314 J/K/mole, C =12,0 = 16)

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128. Three moles of an ideal gas are expanded isothermally from a volume of $300 cm^3$ to 2.5L at 300 K against a pressure of 1.9 atm. Calculate the work done in L atm and joules

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129. Three moles of an ideal gas are compressed isothermally and reversibly to a volume of 2L. The work done is 2.983 kj at $22^{\circ} C$. Calculate the initial volume of the gas

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130. A sample of gas absorbs 4000 kj of heat (a) if volume remains constant what is ΔU? (b) Suppose that in addition to absorption of heat by thesample, the surrounding does 200 kj of work on the sample.What is ΔU? (c) Suppose that as the original sample absorbs heat, it expands against atmospheric pressure and does 600 kj of work, on its surroundings. What is ΔU?

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131. Oxidation of propane is represented as $C_3H_{8(g)} + 5O_{2(g)} \rightarrow 3CO_{2(g)} + 4H_2O_g \Delta H^\circ = -2043KJ$ How much pressure volume work is done andwhat is the value ΔU at constant pressure of latm when the volume change is + 22.4 L.

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132. The heat of formation of methane gas at 298 K is -74.894 kj when the measurements are made at constant pressure. What will be the heat of formation of CH_4 at the same temperature but at constant volume? $\left(R = 8.314JK^{-1}mol^{-1}\right)$

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133. In a particular reaction the system absorbs 12kJ of heat and does 3kJ of work on its surroundings. What are changes in internal energy and enthalpy of system?

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134. In a particular reaction 2kJ of heat is released from the system and 8kJ of work is done on the system. What are changes in internal energy and enthalpy of system?

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135. An ideal gas expands from a volume of 5dm3 to 15dm3against a constant external pressure of $2.025 \times 10^5 Nm^{-2}$. Find ΔH if Δu is 410J.

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136. Calculate the difference in heat of reaction at constant pressure and at constant volume at 300K. $C_s + 2H_{2(g)} \rightarrow CH_{4(g)}$ $(R = 8.314 \text{J} K^{-1} mol^{-1}$

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137. How much heat is evolved when 12 gm of CO reacts with N02 according to the following reaction, $4CO_{(g)} + 2NO_{2(g)} \rightarrow 4CO_{2(g)} + N_{2(g)} \Delta H^{\circ} = -1200kJ$

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138. $2SO_2(g) + O2(g) \rightarrow$ 2SO3(g) From this reaction calculate work done due to oxidation of one mole of SO_2 at $50^\circ C$.

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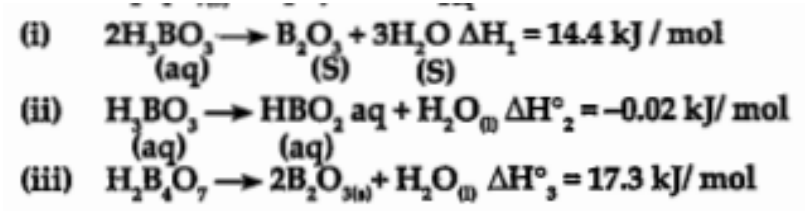
139. Calculate $DelatH^\circ$ forthe followingreaction at 298K $H_2B_4O_{7(s)} + H_2O_i \rightarrow HBO_{2aq}$



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140. Calculate the total heat required (a) to melt 180 g to ice at $O^\circ C$ (b) heat it to $100^\circ C$ and then (c) vaporise it at that temperature. Given Δ_{fus}H^@$(d) = 6.01 kjmol$atO^@C Delta

vapH_(H2O) $= 40.7 kjmolat$100^ $O^\circ C$@C` Specific heat of water

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141. Calculate standard enthalpy of the reaction $Fe_2O_{3(s)} + 2CO_{(g)} 2Fe_{(s)} + 3CO_{2(g)} \text{ømthefollow} \in \text{gdate}$ DeltafH^@ (Fe_2O_3) = - 824.2 kj mol^(-1), DeltafH^@ (Fe_2O_3) = - 110.5 kj mol^(-1)DeltafH^@(CO_2) =- 393.5kJ mol^(-1)`

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142. Calculate C-Cl bond enthalpy from following data: $CH_3CI(g) + CI_2(g) \rightarrow CH_2CI_2(g) + HCI(g) \Delta H^\circ = -104 kj$

Bond	C–H	Cl–Cl	H–Cl
$\Delta H°$/ kJmol^{-1}	414	243	431

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143. 6.24 g of ethanol are vapourized by supplying 5.89 kj of heat energy. What is enthalpy of vapourization of ethanol?

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144. State whether following ,reactions are spontaneous or not. Further State whether they are exothermic or endothermic. $\Delta H = -110kJ$ and $\Delta S = +40JK^{-1}at400K$

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145. State whether following ,reactions are spontaneous or not. Further State whether they are exothermic or endothermic.

$\Delta H = -50kJ$ and $\Delta S = +130JK^{-1} at 250K$

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146. For a certain reaction, ΔH° =- 224 kj and $\Delta S^{\circ} = -153JK^{-1}$. At what temperature the change over from spontaneous to non-spontaneous will occur?

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147. For the reaction, $C_2H_4(g) + H_2(g) \rightarrow C_2H_6(g), K_p = 3.356 \times 10^{17}$ Calculate ΔG^{o} for the reaction at $25^{\circ}C$.

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148. CaIculate AStotal and state whether the reaction is spontaneous or non-spontaneous at $25^\circ C$.

$HgS(s) + O_2(g) \rightarrow Hg(I) + SO_2(g) \Delta H^\circ$ = -238.6 kj, ΔS° = + 36.7J K^(-1)`.

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149. Although ΔS for the formation of two moles of water from H_2 and O_2 is = -327 JK-1 it is spontaneous.Explain $(Given \Delta Hf \text{ or } thereactionis - 572KJ)$

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150. For a certain reaction, ΔH° =- 219 kJ and ΔS° = - $21JK^{-1}$ Determine whether the reaction is spontaneous or

nonspontaneous.

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151. Determine ΔS_{Total} and decide whether the following reaction is spontaneous at $298K$. $Fe_2O_{3(s)} + 3CO_{(g)} \rightarrow 2Fe_s + 3CO_{2(g)}$

$\Delta H^\circ = -24.8kj, \Delta S^\circ = +15JK^{-1}$

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152. Calculate ΔG for the reaction at $25^\circ C$ $CO_{(g)} + 2H_{2(g)} \leftrightarrow CH_3OH_{(g)} \Delta G^\circ = -24.8kjmol^{-1}$ if $P_{CO} = 4atm, P_{H_2} = 2atm, P_{CH_3OH} = 2atm,$

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153. For a water gas reaction $C(s) + H_2O(g) \leftrightarrow CO(g) + H_2(g) at 1000^\circ C$, the standard Gibb's energy change is $-8.1 KJ mol^{-1}$. Calculate the value of equilibrium constant.

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154. K_p for the reaction, $MgCO_{3(s)} \rightarrow MgO_{(s)} + CO_{2(g)}$ is 9×10^{-10}. Calculate ΔG° for the reactionat $25^\circ C$.

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155. At $60^\circ C$, dinitrogen tetraoxide is fifty percent dissociated. Calculate the standard free energy change at this temperature and at one atmosphere.

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156. Calculate ΔS_{sun}. when one mole of methanol (CH_3OH) is formed from its elements under standard conditions if $\Delta_t H^\circ(CH_3OH) = -238.9 kjmol(-1)$.

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157. For a certain reaction, $\Delta H^\circ = -224 kJ$ and $\Delta S^\circ = -153 JK^{-1}$. At what temperature will it change from spontaneous to non-spontaneous?

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158. Determine whether the following reaction will be spontaneous or non-spontaneous under standard conditions. `Zn_((s)) + Cu^2+_((aq)) rarr Zn^2+_((aq)) + Cu_((s)) DeltaH^@ = -219 kj, DeltaS^@ =- 21 JK^(-1).

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159. One mole of an ideal gas is compressed from 500 cm3 against a constant external pressure of 1.2×10^5 Pa The work involved in the process is 36.0 J. Calculate the final volume.

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160. Calculate the maximum work when 24 g of O_2 are expanded isothermally and reversibly from the pressure of 1.6

bar to1bar at 298 K.

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161. Three moles of an ideal gas are compressed isothermally and reversibly to a volume of 2L. The work done is 2.983 kj at $22^{\circ}C$. Calculate the initial volume of the gas

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162. $2.8 \times 10^{-2} kg$ of nitrogen is expanded isothermally and reversibly at 300 K from $15.15 \times 10^{5} NM^{-2}$ when the work done is found to be -17.33 KJ Find the final pressure.

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163. Calculate the work done in lit-atm, joule, erg, calorie, when an ideal gas expands from 5 L to 10 L against a constant pressure of 304 cm of Hg.

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164. A chemical reaction takes place in a container of cross sectional area $100cm^2$. the container has a loosely fitted piston one end. As a result of the reaction, a piston is pushed out through 10 cm against an external pressure of 1.0 atm. Calculate the work done by the system.

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165. A certain amount of gas is compressed from 101.325kPa to1013.25kPa at300K and heat given out is 5.15 kJ. Calculate the number of moles.

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166. 0.28 mmol of a perfect gas occupies12.7L at 310 K after that volume increase by 3.3 L Calculate the work done when the gas expands (i) isothermally against a constant external pressure of 0.25 atm

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167. 0.28 mmol of a perfect gas occupies12.7L at 310 K. after that volume increase by 3.3L. Calculate the work done when the gas

expands. isothermally and reversibly

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168. 0.28 mmol of a perfect gas occupies12.7L at 310 K. Calculate the work done when the gas expands. into vacuum, until its volume has increased by 3.3 L.

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169. Calculate the work done in the following reaction when 2 moles of HCl are used at constant pressure and 432 K. $4HCI_{(g)} + O_{2(g)} \rightarrow 2CI_{2(g)} + 2H_2O((g))$ State whether work is done on the system or by the system

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170. Calculate and find volume in m3 if the work done is1.515 kjduring isothermal expansion of $15.5 \times 10^{-3} m^3$ of an ideal gas against a pressure of $2.02 \times 105 N m^{-2}$ (R = 8.314 J/mol/K)

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171. A sample of gas absorbs 4000 kJ of heat. If volume remains constant, what is ΔU?

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172. A sample of gas absorbs 4000 kJ of heat. Suppose that in addition to absorption of heat by the sample, the surroundings, does 2000 J of work on the sample, what is ΔU?

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173. A sample of gas absorbs 4000 kj of heat (a) if volume remains constant what is ΔU? (b) Suppose that in addition to absorption of heat by thesample, the surrounding does 200 kj of work on the sample.What is ΔU? (c) Suppose that as the original sample absorbs heat, it expands against atmospheric pressure and does 600 kj of work, on its surroundings. What is ΔU?

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174. 38.55kjof heat is absorbed when 6.0 g of 02 react with C1F according to the reaction, $2CIF_g + O_{2(g)} \rightarrow CI_2O_g + OF_{2(g)}$ What is the standard enthalpy of the reaction?

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175. Given the reaction,

$CH_{2}O_{(g)} + O_{2(g)} \rightarrow CO_{2(g)} + H_{2}O_{(g)} \Delta H = -527kJ$

How much heat will be evolved in the formation of 30 g of CO_2 ?

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176. The heat of the reaction,

$C_{2}H_{6(g)} + 3.5O2_{(g)} \rightarrow 2CO_{2(g)} + 3H_{2}O_{(I)} is -1560.63kJ$

at 298K.Calculate the heat of the reaction at constant volume and at 298 K. $\left(R = 8.314JK^{-1}mol^{-1}\right)$

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177. Calculate heat of formation of carbon dioxide at constant volume at 300 K. Given that:

$C(s) + O2(g) \rightarrow CO_2(g) \Delta H = -393kJ$

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178. Calculate heat of formation of water at constant volume at 300 K. Given that:

$H_{2(g)} + \frac{1}{2}O_{2(g)} \rightarrow H_2O_l \Delta H = -284.2kJ$

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179. Calculate heat of formation of ethanol at constant volume at 300 K. Given that:

$C_2H_5OH(l) + 3O2(g) \rightarrow 2CO_{2(g)} + 3H_2O_l \Delta H = -1362.7kJ$

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180. Calculate the enthalpy of hydrogenation of C2H4, $C_2H_{4(g)} + H_{2(g)} \rightarrow C2H_{6(g)}$ Given bond enthalpies of H- H, C = C, C-C,C -H bonds as 433, 615,347 and 413 kJ mol^{-1}.

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181. Estimate the standard enthalpy of combustion of acetylene from the following data: $\Delta_f H^\circ(CO_2) = -393.5 kjmol^{-1}$

$\Delta_f H^\circ(H_2O) = -285.8 kjmol^{-1}$

$\Delta_f H^\circ(C_2H_2) = +227.3 kjmol^{-1}$

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182. The enthalpy changes for the reaction $C_2H_4(g) + H_2(g) \rightarrow C_2H_6(g)$ is -620J When 100ml of ethylene and 100ml of $H_2 reacts$ at 1 bar pressure. Calculate the pressure volume type of work and ΔU for the reaction

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183. The heat evolved in a reaction of 7.5 g of Fe_2O_3 with enough CO is1.164 kj. Calculate ΔH° for the reaction. (At wt. of Fe = 56) $Fe_2O_3 + 3CO_{(g)} \rightarrow 2Fe_{(s)} + 3CO_{2(g)}$

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184. The standard enthalpy change for the reaction $H_{2(g)} \rightarrow H_{(g)} + H_{(g)} is + 436.4 kj$mol^(-1)`. Calculate

standard enthalpy of formation of atomic hydrogen.

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185. For a certain reaction $\Delta H = -25kJ$ and $\Delta S = -40JK^{-1}$. At what temperature will it change from spontaneous to non-spontaneous reaction?

Watch Video Solution

186. Calculate Kp for the reaction,

$C_2H_{4(g)} + H_{2(g)} \rightarrow C2H_{6(g)}$

$\Delta G^{\circ} = -100kjmo^{1-1}at25^{\circ}C.$

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187. Calculate AStotal and state whether the reaction is spontaneous or non-spontaneous at $25^\circ C$. $HgS(s) + O_2(g) \rightarrow Hg(I) + SO_2(g) \Delta H^\circ$ = -238.6 kj, ΔS° = + 36.7J K^(-1)`.

Watch Video Solution

188. For melting of ice at $25^\circ C$ the enthalpy of fusion is $6.97 kjmol^{-1}$ and entropy of fusion is $25.4 JK - 1mol^{-1}$. Calculate free energy change and predict whether melting of ice is spontaneous or not at this temperature.

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189. Calculate the standard entropy change for a reaction $X \rightarrow Y$ if the value of $\Delta H^{\circ} = +28.40$ kJ and equilibrium constant is $1.8 \times 10 - 7$ at 298 K.

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190. Calculate the standard entropy change for a reaction $X \rightarrow Y$ if the value of $\Delta H^{\circ} = +28.40$ kJ and equilibrium constant is $1.8 \times 10 - 7$ at 298 K.

Watch Video Solution

191. Determine whether the reactions with the following AH and AS values are spontaneous or non-spontaneous. State whether

they are exothermic or endothermic: DeltaH =- 40 kj and DeltaS = + 135J K-1 at 300 KDeltaH = -60 kj and DeltaS = -160 JK-1 at 400K`

Watch Video Solution

192. K_p for the reaction. $2SO_{2(g)}O2_{(g)} \rightarrow 2SO_{3(g)}is$7.1 x 10^(24)$at298K$. Calculate$\Delta G^\circ f$ or $thereaction$. R = 8.314 J K^(-1) mol^(-1)`.

Watch Video Solution

193. Calculate AStotal and state whether the reaction is spontaneous or non-spontaneous at $25^\circ C$. $HgS(s) + O_2(g) \rightarrow Hg(I) + SO_2(g)\Delta H^\circ$ = -238.6 kj, ΔS° = + 36.7J K^(-1)`.

Watch Video Solution

194. In a process 701J of heat is absorbed by a system & 394J of work is done by the system What is the change in internal energy for the process

Watch Video Solution

195. The reaction of Cyanamide $NH_2CN_{(s)}$ with dioxygen carried out in a bomb calorimeter and AU was found to be-741.7 KJ/mol at 298K. Calculates the enthalpy change for the reaction at 298K .

Watch Video Solution

196. Enthalpies of formation of $CO_{(g)}$, $CO2_{(g)}$ $N_2O_{(g)}$ $4N_2O_{4(g)}$ are -110, -393.81 & 9.7 KJ mol'1 respectively find the value of H for the reaction. $N_2O_4 + 3CO_{(g)} \rightarrow N_2O_{(g)} + 3CO_2$,

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197. The equilibrium constant for a reaction is 10. What will be the value of $\Delta G^\circ R = 8.314 Jk^{-1} mol^{-1}$ at T= 300K

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198. 300 mol of perfect gas occupies 13L at 320k Calculate the work done-in Joules when the gas expands by volume of 3L

more : Isothermally against a constant external pressure of 0.2 atm.

Watch Video Solution

199. 300 m mol of an ideal gas occupies $13.7 dm^3 at 300 K$. Calculate the work done when the gas is expanded until its volume has increased by $2.3 dm^3$ (a) isothermally against a constant external pressure of 0.3 bar (b) isothermally and reversibly (c) into vaccum.

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200. 300 m mol of an ideal gas occupies $13.7 dm^3 at 300 K$. Calculate the work done when the gas is expanded until its volume has increased by $2.3 dm^3$ (a) isothermally against a

constant external pressure of 0.3 bar (b) isothermally and reversibly (c) into vaccum.

Watch Video Solution

201. What is the value of ASsurr for following reaction at 298 k?

$6Co_{2(g)} + 6H_2O_{(i)} \rightarrow C_6H_{12}O_6\_((s)) + 6O_{2(g)}$ given that, $\Delta G^\circ = 2879 kjmol^{-1} \Delta S = -210 JK^{-1}mol^{-1}$

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202. One mole of a gas expands by 3L against a constant pressure of 3 atmosphere work done in_____ L-atmosphere

Watch Video Solution

203. One mole of a gas expands by 3L against a constant pressure of 3 atmosphere. calculate work done in Joules

Watch Video Solution

204. One mole of a gas expands by 3L against a constant pressure of 3 atmosphere work done in calories

Watch Video Solution

205. Determine whether reactions With following ΔH and ΔS values are spontaneous or non spontaneous. State whether they are exothermic or endothermic. $\Delta H = -110kj$ and $\Delta S = +40JK - lmol - 1at400K$

Watch Video Solution

206. Determine whether reactions With following ΔH and ΔS values are spontaneous or non spontaneous. State whether they are exothermic or endothermic.

$\Delta H = +40kj$ and $\Delta S = -120JK-1mol-1at250K$

Watch Video Solution

207. Calculate C-Cl bond enthalpy from following data:

$CH_3CI(g) + CI_2(g) \rightarrow CH_2CI_2(g) + HCI(g) \Delta H^\circ = -104kj$

Bond	C–H	Cl–Cl	H–Cl
$\Delta H°/kJmol^{-1}$	414	243	431

Watch Video Solution

208. Calculate ΔH° for the reaction between ethene and water to form ethyl alcohol from the following data $\Delta H^{\circ} C_2H_2OH_{(g)} - 1368kJ$:

$\Delta_c H^{\circ} C_2H_2OH4((g)) - 1410kJ$ Does the calculated ΔH° represent the enthalpy of formation of liquid ethanol.

Watch Video Solution

209. 5 moles of helium expand isothermally and reversibly form a pressure $40 \times 10 - 5Nm^{-2} \rightarrow 4 \times 10^{-5} at 300K$ Calculate the work done, change in internal energy and heat absorbed during the expansion. $\left(R - 8.314Jk^{-1}mol^{-1}\right)$

Watch Video Solution

Exercise

1. The correct thermodynamic conditions for the spontaneous reaction at all temperatures are

A. $\Delta H < 0$ and $\Delta S > 0$

B. $\Delta H > 0$ and $\Delta S < 0$

C. $\Delta H < 0$ and $\Delta S < 0$

D. $\Delta H < 0$ and $\Delta S = 0$

Answer:

Watch Video Solution

2. A gas is allowed to expand in a well insulated container against a constant extremal pressure of 2.5 bar from an initial

volume of 2.5 L to a final volume of 4.5L.The change in internal energy. ΔU of the gas will be

A. $-505J$

B. $+505J$

C. $-1013J$

D. $1013J$

Answer:

Watch Video Solution

3. In which of the following entropy of the system decreases?

A. Crystallization of liquid in to solid

B. Temperature of crystalline solid in increased from 0 K to 115 K

C. $H_{2(g)} \rightarrow 2H_{(g)}$

D. $2NaHCO_3(s) \rightarrow Na_2CO_3(s) + CO_2(g) + H_2O(g)$

Answer:

Watch Video Solution

4. The enthalpy of formation for all elements in their standard state is

A. unit

B. Zero

C. less than zero

D. different elements

Answer:

Watch Video Solution

5. Which of the following reaction is exothermic ?

A. $H_2(g) \rightarrow 2H(g)$

B. $C(s) \rightarrow C(g)$

C. $2CI(g) \rightarrow CI_2(g)$

D. $H_2O(s) \rightarrow H_2O_{(l)}$

Answer:

Watch Video Solution

6. 6.24 g of ethanol are vaporized by supplying 5.89kJ of heat.Enthalpy of vaporization of ethanol will be

A. $43.4kJmol^{-1}$

B. $60.2kJmol^{-1}$

C. $38.9kJmol^{-1}$

D. $204kJmol^{-1}$

Answer:

Watch Video Solution

7. If the standard enthalpy of formation of methanol is $-238.9kJmol^{-1}$ then entropy change of the surroundings will be.

A. $-801.7JK^{-1}$

B. $801.7JK^{-1}$

C. $0.8017JK^{-1}$

D. $-0.8017JK^{-1}$

Answer:

Watch Video Solution

8. For vaporization of water at 1bar,$\Delta H = 40.63kJmol^{-1}$and $\Delta S = 108.8JK^{-1}mol^{-1}$At what temperature, $\Delta G = 0$?

A. 273.4K

B. 393.4K

C. 373.4K

D. 293.4K

Answer:

Watch Video Solution

9. Bond enthalpies of H-H, Cl-Cl and H-Cl bonds are $434kjmol^{-1}$, $242kjmol^{-1}$ and $431kjmol^{-1}$, respectively. Enthalpy of formation of HCl is

A. A. $245kJmol^{-1}$

B. B. $-93kJmol^{-1}$

C. C. $-245kJmol^{-1}$

D. D. $93kJmol^{-1}$

Answer:

Watch Video Solution

10. Which of the following is not a state function?

A. q_p

B. q

C. enthalpy

D. entropy

Answer:

Watch Video Solution

11. Which of the following is not an extensive property?

A. molarity

B. heat capacity

C. mass

D. volume

Answer:

Watch Video Solution

12. An endothermic reaction is one in which heat content of

A. products is more than that of reactants

B. reactants is more products in same

C. reactants and products is same

D. none of these

Answer:

Watch Video Solution

13. In a chemical reaction, work is done by the system when

A. number of molesof gaseous reactantsisequal to the number of moles of gaseous products

B. total number of moles increases

C. number of moles of gaseous substances decreases

D. number of moles of gaseous product is greater than the number of moles of gaseous reactants.

Answer:

Watch Video Solution

14. Which of the following is an intensive property?

A. enthalpy

B. Mass

C. Temperature

D. volume

Answer:

Watch Video Solution

15. When a sample of an ideal gas is allowed to expand at constant temperature against an atmospheric pressure,

A. surroundings do work on the system

B. $\Delta U = 0$

C. no heat exchange takes place between the system and surroundigs

D. internal energy of the system work is done

Answer:

Watch Video Solution

16. A gas of 0.320 kJ works on its surroundings and absorbs 120 J of heat from the surroundings. Hence, ΔU is

A. 440 kJ

B. 200J

C. 120.32J

D. $-200J$

Answer:

Watch Video Solution

17. In the reaction, $H_2 + Cl_2 \rightarrow 2HCl\ \Delta H$ =-184 kJ, if 2 moles of H2 react with 2 moles of Cl_2, then ΔU is equal to

A. $-184kJ$

B. $-368kJ$

C. zero

D. $+368kJ$

Answer:

Watch Video Solution

18. The enthalpies of formation of N_2O and NO at 298 K are 82 and 90 kJ mol^{-1}. The enthalpy of the reaction : $2N_2O_{(g)} + \frac{1}{2}O_{2(g)} \rightarrow 4NO_{(g)}$ is

A. $+8kj$

B. 88kJ

C. $-16kJ$

D. 196kJ

Answer:

Watch Video Solution

19. For which of the following substances $\Delta_f H^\circ$ is not zero.

A. Ca(s)

B. He(g)

C. P(red)

D. $CH_3OH_{(i)}$

Answer:

Watch Video Solution

20. If for a reaction, ΔH is negative and ΔS is positive then the reaction is

A. spontaneous at all temperatures

B. non-spontaneous at all temperatures

C. spontaneous only at high temperature

D. spontaneous only at low temperature

Answer:

Watch Video Solution

21. Properties of a system which are proportional to the quantity of matter contained in the system are called

A. thermodynamic variables

B. mass variables

C. extensive properties

D. intensive properties

Answer:

Watch Video Solution

22. Obtain the relationship between $DelatG^{\circ}$ of a reaction and equilibrium constant.

A. $-\Delta G^{\circ} = \frac{RT}{InK}$

B. $\Delta G^{\circ} = \frac{RT}{InK}$

C. $\frac{RTInK}{\Delta G^{\circ}} = -1$

D. $\Delta G^{\circ} = RTInK$

Answer:

Watch Video Solution

23. ΔH for the reaction $2H_g \rightarrow H_2(g)$ will be

A. zero

B. positive

C. negative

D. infinite

Answer:

Watch Video Solution

24. For the process, $H_2O(l) \rightarrow H_2O_{(g)}$ at $100^\circ C$, ΔS is

A. positive

B. negative

C. zero

D. unpredictable

Answer:

Watch Video Solution

25. Which represents largest amount of energy?

A. 5 calorie

B. 2 Joule

C. 5erg

D. 5eV

Answer:

Watch Video Solution

26. Which of the following process is non-spontaneous?

A. dissolving KCI in water

B. mixing of iodine vapour and nitrogen gas

C. decomposition of NaCl to Na

D. freezing of water at 270K

Answer:

Watch Video Solution

27. For which of the following reaction ΔS is negative?

A. $Mg_{(s)} + CI_{2(g)} \rightarrow MgCI_{2(s)}$

B. $H_2O_{(l)} \rightarrow H_2O_{(g)}$

C. $CaCO_{3(s)} \rightarrow CaO_{(s)} + CO_{2(g)}$

D. $I_{2(g)} \rightarrow 2I_g$

Answer:

Watch Video Solution

28. A gas expands in volume from 2 L to 5 L against a pressure of1atm at constant temperature. The work done by the gas will be

A. $+3J$

B. $-303.9J$

C. $-303.9L.\ atm$

D. $+303.9L.\ atm$

Answer:

Watch Video Solution

29. A thermally isolated gaseous system can exchange energy with the surroundings. The mode of transfer of energy can be

A. heat

B. work

C. heat and radiation

D. none of these

Answer:

Watch Video Solution

30. Which of the following groups includes two intensive properties and one extensive property of a system ?

A. temperature, energy, mass

B. mass, volume, density

C. optical activity, volume, specific heat

D. boiling point volume energy

Answer:

Watch Video Solution

31. Identify the state function among the following.

A. q

B. q-w

C. q / w

D. q+w

Answer:

Watch Video Solution

32. Energy equivalent to one erg, one joule, and one calorie in the increasing order is

A. $1erg < 1J < 1cal$

B. $1erg < 1cal < 1J$

C. $1cal < 1J < 1erg$

D. $1J < 1cal < 1erg$

Answer:

Watch Video Solution

33. During an isothermal expansion of an ideal gas,

A. the internal energy increases

B. the temperature decreases

C. the internal energy remains unchanged

D. the internal energy decreases

Answer:

Watch Video Solution

34. Which one of the following statements is incorrect?

A. For isothermal process, $dU=0$

B. For isochoric process, $dT=0$

C. For adiabatic process, $q=0$

D. For isobaric process, $dP=0$

Answer:

Watch Video Solution

35. The temperature of the system decreases in an

A. isothermal compression

B. isothermal expansion

C. adiabetic compression

D. adiabatic expansion

Answer:

Watch Video Solution

36. For a cyclic process, which of the following is correct ?

A. Work done is zero

B. change in internal energy is not zero

C. No heat is absorbed or evolved

D. $\Delta U = 0$

Answer:

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37. A gas absorbs 100 calories of heat energy and is compressed from 10.0 L to 5.0 L by applying an external pressure of 2.0atm. The change in internal energy is

A. 312 cal

B. 342 cal

C. 426 cal

D. 562 cal

Answer:

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38. Work done in vaporization of 1 mole of water at 373K against a pressure of 1 atm.is approximately. Assume ideal gas behavior

A. $-3100.0J$

B. $-31.20J$

C. $-20.2J$

D. $+3100J$

Answer:

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39. A gas can expand from 100 mL to 250 mL under a constant pressure of 2 atm. The work done by the gas is

A. 30.38 Joule

B. 25 Joule

C. 5 kJoule

D. 16 Joule

Answer:

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40. 2×10^{-3} kg of H_2 and 32×10^{-3} kg of O_2 separately expand reversibly from the same initial pressure to same final

pressure at the same constant temperature. The work done by these gases are W_1 and W_2 respectively. Then,

A. $W1 > W2$

B. $W1 < W2$

C. $W_1 = W_2$

D. $W_2 = 16W_1$

Answer:

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41. Two moles of an ideal gas expand spontaneously into a vacuum. The work done is

A. infinity

B. zero

C. 2J

D. 40J

Answer:

Watch Video Solution

42. When an ideal gas expands in vacuum, no work is done because

A. opposing force is very large

B. driving force is very small

C. gas moecules do not move away from each other

D. Opposing force is almost zero

Answer:

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43. Which of the following is a non-spontaneous process?

A. Water flowing downhill

B. Expansion of a gas into vacuum

C. Evaporation of water from clothes during drying

D. Heat flowing from colder body to a hotter body

Answer:

Watch Video Solution

44. Which of the following is not a state function?

A. Internal energy

B. Enthalpy

C. Work

D. Pressure

Answer:

Watch Video Solution

45. A gas absorbs 250J of heat and expands from 1 litre to 10 litre at constant temperature against external pressure of 0.5atm. The values of q, w and ΔU will be respectively

A. $-250J, 455J, 710J$

B. $250J, -455J, -205J$

C. $-250J, -455J, -205J$

D. $-250J, 455J, 205J$

Answer:

Watch Video Solution

46. Which of the following is not correct about enthalpy?

A. It is an extensive property

B. It is not a state function

C. Its absolute value cannot be determined

D. Enthalpy of a compound- Enthalpy of formation of that compound.

Answer:

Watch Video Solution

47. If the pressure of asystem isnot fixed, the enthalpy change can be defined as

A. $\Delta H = \Delta U + \Delta(PV)$

B. $\Delta H = \Delta U + P\Delta V$

C. $H = U + PV$

D. $H = U + \Delta(PV)$

Answer:

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48. The difference between heats of reaction at constant pressure and constant volume for the reaction

$2C_6H_{6(i)} + 15O_{2(g)} \rightarrow 12CO_{2(g)} + 6H_2O((I))$ at $25^\circ C$ in kJ is

A. -7.43

B. $+3.72$

C. -3.72

D. $+7.43$

Answer:

Watch Video Solution

49. During the evaporation of a liquid,

A. the enthalpy decreases

B. the enthalpy increases

C. the enthalpy remains unchanged

D. the internal energy decreases

Answer:

Watch Video Solution

50. For an endothermic reaction,where ΔH represents the enthalpy of the reaction in kJmol^{-1}, the minimum value for the energy of activation will be

A. less than ΔH

B. Zero

C. more than ΔH

D. equal to ΔH

Answer:

Watch Video Solution

51. You are given the following two reactions : $CH_{4(g)} + 2O_{2(g)} \rightarrow CO_{2(g)} + 2H_2O_{(g)}$ $\Delta H = -890.4kJ$, $2HgO_{(s)} \rightarrow 2Hg_{(l)} + O_{2(g)}$ $\Delta H = +181.6kJ$ Which one of the following statements is correct?

A. Both reactions are exothermic

B. Both reactions are endothermic

C. Reaction: is endothermic and is exothermic

D. Reaction: is exothermic and is endothermic

Answer:

Watch Video Solution

52. The activation energy of exothermic reaction is 20 kj. The heat of the same reaction is -50 kj. The activation energy of the reverse reaction in kj would be

A. 30

B. 20

C. 70

D. 50

Answer:

Watch Video Solution

53. Translational energy is not prossessed by

A. water

B. ice

C. C_{12} gas

D. argon gas

Answer:

Watch Video Solution

54. The internal energy of a system can be changed by

A. heat flow into the system

B. work done by the system

C. work done on the system

D. All of these

Answer:

Watch Video Solution

55. The change in the internal energy of a system for 1 mole of a gas is equal to

A. Cv/dT

B. CvdT

C. Cv/T

D. Cv T

Answer:

Watch Video Solution

56. The molar heat capacity of water is _____if its specific heat capacity is 4.184 JK^1.

A. $4.184 Jmol^{-1}K^{-1}$

B. $75.3 Jmol^{-1}K^{-1}$

C. $185 Jmol^{-1}K - 1$

D. $1 Jmol^{-1}K^{-1}$

Answer:

Watch Video Solution

57. For two moles of an ideal gas, which of the following is true?

A. $C_p - C_v = 2R$

B. $C_v - C_p = 2R$

C. $C_p - C_v = R$

D. $C_P - C_v = R/2$

Answer:

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58. Which of the following is true?

A. $\left(\frac{dq}{dT}\right)_P = C_P$

B. $\left(\frac{dq}{dT}\right)_V = C_V$

C. $\frac{dH}{dT} = C_P$

D. All of these

Answer:

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59. The molar heat capacity of water is _____if its specific heat capacity is 4.184 JK^1.

A. an extensive property

B. an intensive property

C. a path function

D. independent of temperature

Answer:

Watch Video Solution

60. Calculate the heat of reaction at 298 K for the reaction $C_2H_{4(g)} + H_2(g) \rightarrow C_2H_{6(g)}$ given the heats of combustion

of ethylene, hydrogen and ehane are 337.0,68.4 and 373.0 kcal respectviely.

A. 23.4 kcal

B. 62.2 kcal

C. 32.4 kcal

D. 34.2 kcal

Answer:

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61. The enthalpies of elements in their standard states are taken as

A. zero at 298 K

B. unity at 298 K

C. zero at 273 K

D. zero at 25 K

Answer:

Watch Video Solution

62. The standard heat of formation of diamond is

A. same as that of graphite

B. greater than that of graphite

C. less than of graphite

D. taken as zero

Answer:

Watch Video Solution

63. Which of the following values of $\Delta_f H$ represents the least stable product?

A. $-229.6kJ$

B. $-76kJ$

C. $+12.1kJ$

D. $+102.6kJ$

Answer:

Watch Video Solution

64. The enthalpies of formation of N_2O and NO at 298 K are 82 and 90 kJ mol^{-1}. The enthalpy of the reaction : $2N_2O_{(g)} + \frac{1}{2}O_{2(g)} \rightarrow 4NO_{(g)}$ is

A. $-8kJ$

B. $+98kJ$

C. $-74kJ$

D. $+196kJ$

Answer:

Watch Video Solution

65. The latent heat of vaporization of a liquid at 500 K at1atm pressure is 10 kcal/mol. The change in the internal energy of 3

mole of liquid at same temperature will be

A. $-13kcal$

B. $+13kcal$

C. $+27kcal$

D. $-27kcal$

Answer:

Watch Video Solution

66. For a gaseous reaction involving complete combustion of isobutane,

A. $\Delta H = \Delta U$

B. $\Delta H > \Delta U$

C. $\Delta H < \Delta U$

D. $\Delta H = 0, \Delta U \neq 0$

Answer:

Watch Video Solution

67. The difference between ΔH and ΔU for the combustion of methane at $27^{\circ} C$ would be

A. $8.314 \times 300(-3) J$

B. $8.314 \times 27(-3) J$

C. $8.314 \times 300(-2) J$

D. zero

Answer:

Watch Video Solution

68. Enthalpy of combustion of carbon is -395 kj.The amount of carbon needed to evolve 39.5 kJ is

A. 1 mole

B. 0.5 mol

C. 1.2 g

D. 6 g

Answer:

Watch Video Solution

69. The heats of combustion of hydrogen, carbon monoxide and methane are $-285,\ -284$ and $-890 kjmol^{-1}$. The calorific value is maximum for

A. H_2

B. CO

C. CH_4

D. Cannot be predicated as information is incompete

Answer:

Watch Video Solution

70. The decreasing order of calorific values is

A. $C_2H_2 > C_4H_{10} > C_3H_8 > C_2H_4$

B. $C_4H_{10} > C_3H_8 > C_2H_4 > C_2H_2$

C. $C_2H_4 > C_3H_8 > C_4H_{10} > C_2H_2$

D. $C_3H_8 > C_2H_4 > C_4H_{10} > C_2H_2$

Answer:

Watch Video Solution

71. The heat evolved in the combustion of glucose $(C_6H_{12}O_6)$ is given by the equation $C_6H_{12}O_{6(s)} \rightarrow 6CO_{2(g)} + 6H_2O_{(i)}$, $\Delta H = -680kcal$ The weight of$CO_{2(g)}$ produced when 170 kcal of heat is evolved in the combustion of glucose is.

A. 264 g

B. 66g

C. 11 g

D. 44 g

Answer:

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72. A person requires A kJ of energy daily. If the heat of combustion of cane sugar is -B kJ, then his daily consumption of sugar would be

A. $\frac{A}{B}g$

B. $342\frac{A}{B}g$

C. $342\frac{B}{A}g$

D. $\frac{B}{A}g$

Answer:

Watch Video Solution

73. A person submits to a diet of 9,500 kj per day and expends energy in all forms to a total of 12,000 kj per day. If the energy lost was stored as sucrose (1632 kj per 100 g), the number of days the man will take to lose 1 kg of sucrose (ignoring water loss) would be

A. 6 days

B. 6.53 days

C. 5 days

D. 4 days

Answer:

Watch Video Solution

74. The bond dissodation energies of gaseous H_2, Cl_2 and HCl are 104, 58 and 103kcal respectively.The enthalpy of formation of HCI gas would be

A. A. $-44kcal$

B. B. $-88kcal$

C. C. $-22kcal$

D. D. $-11kcal$

Answer:

Watch Video Solution

75. Given thebond energiesof N=N, H-H,and N-H bonds are 945, 436 and 391 kj mol^{-1} respectively. The enthalpy of the reaction $N_{2(g)} + 3H_{2(g)} \rightarrow 2NH_{3(g)}$ is

A. $-93kJ$

B. $102kJ$

C. $90kJ$

D. $105kJ$

Answer:

Watch Video Solution

76. The bond energy of an O-H bond is109 kcal mol^{-1}. When a mole of water is formed

A. 218 kcal is released

B. 109 kcal is released

C. 218 kcal is absorbed

D. 109 kcal is absorbed

Answer:

Watch Video Solution

77. The mutual heat of neutralisation of 40g NaOH and 60g CH_3COOH will be

A. 57.1 kJ

B. less than 57.1 kJ

C. more than 57.1 kJ

D. 13.7 kJ

Answer:

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78. When 10 ml NaOH is added to 10 ml HCl,the temperature rises by $3^{\circ}C$. If 100 ml each of same solutions are mixed the temperature will rise by

A. A. $30^{\circ}C$

B. B. $3^{\circ}C$

C. C. $0.3^{\circ}C$

D. D. Can not be predicted

Answer:

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79. The heat of neutralization of a strong acid and a strong base is-60 kj. The heat released by mixing 0.5 moles of HCl and

0.2 moles of NaOH would be

A. A. -12 kJ

B. B. -60 kJ

C. C. -30 kJ

D. D. -20 kJ

Answer:

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80. The enthalpy of neutralization of NaOH with HCl is-57.32 kJ while with acetic add it is- 55.2 kJ. This difference is because

A. acetic acid is an organic acid

B. acetic acid is little solube in water

C. acetic acid is weak acid and requires lesser amount of NaOh for neutrolization

D. some heat is required to ionise acetic acid completely

Answer:

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81. The work done during the process when 1 mol of gas is allowed to expand into vaccum is

A. $+ve$

B. $-ve$

C. 0

D. 1

Answer:

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82. Which of the following is an extensive property?

A. Surface tension

B. Refraction index

C. Energy

D. Temperature

Answer:

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83. The enthalpy of formation for all elements in their standard state is

A. unity

B. zero

C. Less than zero

D. different elements

Answer:

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84. In which of the following entropy of the system decreases?

A. Crystallization of liquid in to solid

B. Temperature of crystalline solid is increased from OK to 115K `H_2(g)rarr2H(g)

C. $H_{2(g)} \rightarrow 2H_{(g)}$

D. $2NaHCO_{3(s)} \rightarrow Na_2CO_3(s) + Co_{2(g)} + H_2O_{(g)}$

Answer:

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85. Give the mathematical expression of first low of thermodynamics:

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86. What is the second law of thermodynamics ?

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87. What is enthalpy of the fusion?

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88. In the reaction, $H_2 + Cl_2 \rightarrow 2HCl\ \Delta H$ =-184 kJ, if 2 moles of H2 react with 2 moles of Cl_2, then ΔU is equal to

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89. 22 g of CO_2 are compressed isothermally and reversibly at 298 K frominitial pressure of 100 Kpa when the work obtained is 1.2 KJ. Find the final pressure.

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90. A System absorbs 520J of heat and perform work of 210J calculate the change in internal energy.

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91. 38.55kjof heat is absorbed when 6.0 g of 02 react with C1F according to the reaction, $2CIF_g + O_{2(g)} \rightarrow CI_2O_g + OF_{2(g)}$ What is the standard enthalpy of the reaction?

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92. Calculate the total heat required (a) to melt 180 g to ice at $O^\circ C$ (b) heat it to $100^\circ C$ and then (c) vaporise it at that temperature. Given Δ_{fus}H^@$(d) = 6.01 kjmolat$O^@C Delta

vapH_(H2O) $= 40.7 kjmolat$100^ $O^\circ C$@C` Specific heat of water

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93. 300 m mol of an ideal gas occupies $13.7 dm^3 at 300 K$. Calculate the work done when the gas is expanded until its volume has increased by $2.3 dm^3$ (a) isothermally against a constant external pressure of 0.3 bar (b) isothermally and reversibly (c) into vaccum.

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94. State Hess's law of constant heat summation Illustrate with an example state its application.

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95. Obtain the relation between ΔG and $\Delta S_{\rightarrow tal}$ Comment on Spontaneity of the reaction

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