



CHEMISTRY

BOOKS - MBD CHEMISTRY (ODIA ENGLISH)

THERMODYNAMICS

Question Bank

1. In what type of reaction, heat is absorbed ?

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2. Fill up the gap:

For exothermic reaction, ΔH is _____

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3. In the reaction, $CO(g) + \frac{1}{2}O_2(g) \rightarrow CO_2$ at constant T and P which one of the following is correct ?

(i) $\Delta H = \Delta E$

(ii) $\Delta H > \Delta E$

(iii) $\Delta H < \Delta E$

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4. In an endothermic reaction, ΔH is always _____

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5. The enthalpy of combustion is always _____.

(i) negative, (ii) positive, (iii) zero

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6. Fill up the gap: When ice melts to liquid water, its entropy ____.

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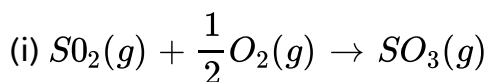
7. In which reaction, the reactants have less energy than the products ?

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8. What is the relationship between enthalpy (H) and internal energy (E) ?

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9. In which of the following changes, there is increase in entropy ?



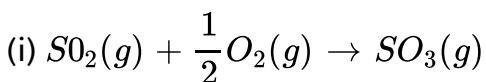
(ii) Ice \rightarrow Water`

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10. When a reaction at constant temperature and pressure is at equilibrium the value of ΔG _____

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11. In which of the following changes, there is increase in entropy ?



(ii) Ice \rightarrow Water`

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12. In which reaction, the reactants have less energy than the products ?

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13. What is the relationship between enthalpy (H) and internal energy (E) ?

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14. In an endothermic reaction, ΔH is always _____

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15. The enthalpy of combustion is always _____.

(i) negative, (ii) positive, (iii) zero

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16. Fill up the gap:

For exothermic reaction, ΔH is _____

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17. The enthalpy of combustion is always _____.

(i) negative, (ii) positive, (iii) zero

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18. What is exothermic reaction ?

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19. In an endothermic reaction, ΔH is always _____

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20. In the reaction, $CO(g) + \frac{1}{2}O_2(g) \rightarrow CO_2$ at constant T and P

which one of the following is correct ?

(i) $\Delta H = \Delta E$

(ii) $\Delta H > \Delta E$

(iii) $\Delta H < \Delta E$

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21. Define Hess's law.

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22. In what type of reaction, heat is absorbed ?

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23. What is heat of reaction ?

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24. The dissociation energy of CH_4 is 360 kcal/mole. What is the energy associated with C-H bond ?

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25. What is bond energy ?

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26. Define heat of combustion.

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27. Write the equation relating free energy, entropy and enthalpy.

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28. Fill up the gap: When ice melts to liquid water, its entropy ____.

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29. What is the free energy change at equilibrium state ?

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30. Define Hess's law.

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31. What is exothermic reaction ?

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32. What is exothermic reaction ?

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33. What is bond energy ?

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34. When a reaction at constant temperature and pressure is at equilibrium the value of ΔG _____

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35. What is bond energy ?

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36. State and explain Hess's law.

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37. State Hess's law.

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38. What is bond energy ?

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39. What do you understand by exothermic and endothermic reaction ? Give one example of each.

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40. What is endothermic reaction. Give example.

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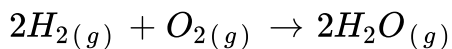
41. When a reaction at constant temperature and pressure is at equilibrium the value of ΔG _____

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42. Define enthalpy of combustion. Give an example.

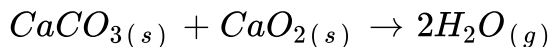
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43. Predict whether ΔS is +ve or -ve for the following reaction.)



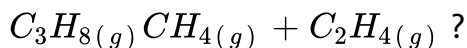
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44. Predict whether ΔS is +ve or -ve for the following reaction.



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45. If ΔH of the reaction $CH_{4(g)} + C_2H_{4(g)} \rightarrow C_3H_{8(g)}$ is -19.4 kcal, what will be the ΔH of the reaction



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46. How does the free energy change show the feasibility of chemical reaction ?

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47. At constant temperature and pressure, which of the following statement is true for the reaction. $CO[g] + \frac{1}{2}O_2[g] \rightarrow CO_2[g]$

A. $\Delta H = \Delta E$

B. $\Delta H < \Delta E$

C. $\Delta H > \Delta E$

D. ΔH is independent to physical state.

Answer: B

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48. The relation between internal energy change, ΔE and enthalpy change' ΔH and work W is

A. $\Delta H = \Delta E + W$

B. $\Delta E = \Delta H - W$

C. $\Delta E = W - \Delta H$

D. $\Delta H = \Delta E - W$

Answer: A



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49. Which of the following is an intensive property ?

A. Temperature

B. Molarity

C. Density

D. All are correct

Answer: D

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50. The value of enthalpy, H in term of R and T for a monoatomic gas is

A. $3RT$

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

C. $5RT$

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

Answer: D

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51. In a spontaneous process, the system suffers

- A. increase in internal energy
- B. lowering in free energy
- C. no energy change
- D. decrease in entropy

Answer: B



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52. 1st law of thermodynamic is represented by the equation.

- A. $\Delta E = Q + W$
- B. $\Delta E = Q - W$
- C. $W = Q + \Delta E$
- D. None of these

Answer: B



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53. Thermodynamic equilibrium involves

- A. Chemical equilibrium
- B. Thermal equilibrium
- C. Mechanical equilibrium
- D. All the three

Answer: D



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54. 'Heat of neutralisation of a strong dibasic acid in dilute solution by NaOH is'

A. -27.4 cal/equ

B. -13.7 cal/equ

C. $+13.7 \text{ cal/equ}$

D. -13.7 cal/mol

Answer: B

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55. ΔH and ΔE for the reaction

$S[s] + \frac{2}{3}O_2[g] \rightarrow SO_3[g]$ are related as

A. $\Delta H = \Delta E + 0.33RT$

B. $\Delta H = \Delta E - 1.5RT$

C. $\Delta H = \Delta E + RT$

D. $\Delta H = \Delta E + 1.5RT$

Answer: A

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56. One mole of an ideal at 300 K is expanded isothermally from an initial volume of 1 liter to 10 liters. The ΔE for this process is [$R = 2 \text{ cal } k^{-1} \text{ mol}^{-1}$]

A. 163.7 cal

B. 1381.1 cal

C. 91 H-atm

D. zero

Answer: B

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57. A well stopped thermosflask contains some ice Cubes. This is an example of a

- A. Closed system
- B. Open system
- C. Isolated system
- D. Non-thermodynamic system

Answer: C



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58. For the reaction



- A. $\Delta E = 2RT$
- B. $\Delta E - 2RT$

C. $\Delta E + RT$

D. $\Delta E + 2RT$

Answer: B

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59. For an ideal gas, the relation between the enthalpy change and internal energy at constant temperature is given by

A. $\Delta H = \Delta E + PV$

B. $\Delta H = \Delta E + \Delta nRT$

C. $\Delta H = \Delta E + P \Delta V$

D. $\Delta H = \Delta G + T \Delta S$

Answer: B

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60. If $C(s) + O_2(g) \rightarrow CO_2(g), \Delta H = X$ and
 $CO(g) + \frac{1}{2}O_2(g) \rightarrow CO_2(g), \Delta H = Y$ then the heat of
formation of CO is

A. $X+Y$

B. $X-Y$

C. $Y-X$

D. XY

Answer: B

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61. Enthalpies of elements in their standard states are taken as zero.
Hence the enthalpy of formation of a compound

A. should always be negative

B. should always be positive

C. will be equal to twice the energy of combustion

D. may be +ve or -ve

Answer: D

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62. Which of the following values of heat of formation indicates that the product is least stable ?

A. -94kcal

B. -231kcal

C. $+21.4\text{kcal}$

D. $+64.8\text{kcal}$

Answer: D

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63. For an adiabatic process, which of the following is correct.

A. $P \Delta V = 0$

B. $q = +w$

C. $\Delta E = q$

D. $q = 0$

Answer: D

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64. Identify the intensive quantity from the following

A. Enthalpy and temperature

B. Volume and temperature

C. Enthalpy and volume

D. Temperature and refractive index

Answer: D

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65. An exothermic reaction is one which

A. takes place on heating

B. is accompanied by flame

C. is accompanied by absorption of heat

D. is accompanied by evolution of heat

Answer: D

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66. An endothermic reaction is one in which

- A. heat is converted into electricity
- B. heat is absorbed
- C. heat is evolved
- D. heat is converted to mechanical work

Answer: B

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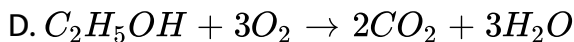
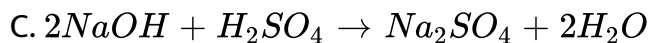
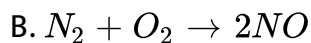
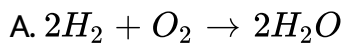
67. Which of the following reaction is exothermic ?

- A. $CaCO_3 \rightarrow CaO + CO_2$
- B. $Fe + S \rightarrow FeS$
- C. $NaOH + HCl \rightarrow NaCl + H_2O$
- D. $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$

Answer: B

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68. Which of the following is an endothermic reaction



Answer: B

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69. In exothermic reaction

A. ΔE is zero`

B. ΔH is -ve

C. ΔS is zero`

D. ΔH is +ve`

Answer: B

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70. For an endothermic reaction

A. ΔH is -ve

B. ΔH is +ve`

C. ΔE is -ve`

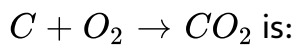
D. $\Delta H = 0`$

Answer: B



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71. Enthalpy for the reaction



A. = *ve*

B. -ve

C. zero

D. none

Answer: B



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72. Enthalpy of a compound is equal to its

A. heat of comustion

B. heat of formation

C. heat of reaction

D. heat of solution

Answer: B



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73. During isothermal expansion of an ideal gas its

A. internal energy increase

B. enthalpy increase

C. enthalpy remains unaffected

D. enthalpy reduces to zero

Answer: C



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74. Heat of neutralisation of a strong acid and strong base is always.

A. 13.7 kcal/mole

B. 9.6 kcal/mole

C. 6 kcal/mole

D. 11.4 kcal/mole

Answer: A

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75. The mutual heat of neutralisation of 40 grams NaOH and 60 grams CH_3COOH will be

A. 56.1 kJ

B. less than 56.1 kJ

C. more than 56.1 kJ

D. 13.7 kJ

Answer: B

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76. In which of the following neutralisation reaction, the heat of neutralisation is the highest

A. NH_4OH and H_2SO_4

B. HCl and NaOH

C. CH_3COOH and KOH

D. CH_3COOH and NH_4OH

Answer: B

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77. Hess's law deals with

- A. change in heat of reaction
- B. rate of reaction
- C. equilibrium constant
- D. influence of pressure on volume of a gas

Answer: A



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78. Hess's law of heat of summation includes

- A. initial reactants only
- B. initial reactants and final products
- C. final products only

D. intermediates only

Answer: B

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79. $H_2(g) + I_2(g) \rightarrow 2HI(g)$, $\Delta H = -12.40 \text{ kcal}$, Heat of formation of HI will be

A. 12.4 kcal

B. -12.4 kcal

C. -6.20 kcal

D. 6.20 kcal

Answer: C

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80. Combustion of methane

- A. is an exothermic process
- B. is an endothermic process
- C. requires catalyst
- D. give H_2

Answer: A

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81. For which reaction, ΔS will be maximum ?

- A. $Ca(s) + \frac{1}{2}O_2(g) \rightarrow CaO(s)$
- B. $CaCO_3(s) \rightarrow CaO(s) + CO_2(g)$
- C. $C(s) + O_2(g) \rightarrow CO_2(g)$
- D. $N_2(g) + O_2(g) \rightarrow 2NO(g)$

Answer: B



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82. The total entropy change for a system and its surrounding increases, if the process is

- A. reversible
- B. irreversible
- C. exothermic
- D. endothermic

Answer: B



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83. Fill up the gap: When ice melts to liquid water, its entropy ____.

A. becomes zero

B. decreases

C. increases

D. remains same

Answer: C



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84. Heat of combustion is always

A. = ve

B. -ve

C. neutral

D. all of the above

Answer: B



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85. Energy required to dissociate 4 gms of gaseous hydrogen into free gaseous atoms is 208 kcals at $25^{\circ}C$. The bond energy of H-H bond will be

- A. 104 kcals
- B. 10.4 kcals
- C. 1040 kcals
- D. 104 cal

Answer: A



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86. If a refrigerator door is opened then we get

- A. room heated
- B. room cooled
- C. more heat is passed out
- D. no effect on room

Answer: A

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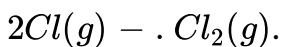
87. When 1 mole of NH_4OH is neutralised by 1 mole of HCl, heat evolved is:

- A. 57.2kj
- B. greater than 57.2 kj
- C. less than 57.2 kj
- D. None of these

Answer: C

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88. For the reaction :



A. $\Delta H = +ve$ and $\Delta S = -ve$

B. $\Delta H = -ve$ and $\Delta S = +ve$

C. $\Delta H = -ve$ and $\Delta S = -ve$

D. $\Delta H = -ve$ and $\Delta S = +ve$

Answer: C

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89. The relation $\Delta G = \Delta H - T \Delta S$ was given by

A. Thomson

B. Faraday

C. Boltzmann

D. Gibbs-Helmholtz

Answer: D

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90. For the formation of NH_3 from N_2 and H_2 , ($\Delta E - \Delta H$) is :

A. RT

B. $-2RT$

C. $2RT$

D. $RT/2$

Answer: C



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91. For $H_2(g) + I_2(g) \rightleftharpoons 2HI(g)$, $\Delta H = 12.4Kcal$. The enthalpy of formation of HI is:

A. 12.4 K cal

B. -12.4 K cal

C. 6.2 K cal

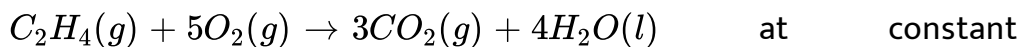
D. -6.2 K cal

Answer: C



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92. For the reaction :



temperature. $\Delta H - \Delta U$ is:

A. RT

B. $-3RT$

C. $= 3RT$

D. $-RT$

Answer: B

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93. The bond energies of C-C, C=C, H-H and C-H linkages are 350, 600, 400 and 410 kJ per mol respectively. The heat of hydrogenation of ethylene is:

A. -170 kJ mol^{-1}

B. -260 kJ mol^{-1}

C. -400 kJ mol^{-1}

D. -450 kJ mol^{-1}

Answer: A

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94. Considering entropy (S) as a thermodynamic parameter the criterion for the spontaneity of any process is:

A. $\Delta S_{system} - \Delta S_{surroundings} > 0$

B. $\Delta S > 0$ only

C. $\Delta S_{surroundings} > 0$ only

D. $\Delta S_{system} + \Delta S_{surroundings} > 0$

Answer: D

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95. A reaction occurs spontaneously if :

A. $T \Delta S > \Delta H$ and ΔH is +ve and ΔS is -ve

B. $T \Delta S = \Delta H$ and both ΔH and ΔS are +ve

C. $T \Delta S < \Delta H$ and both ΔH and ΔS is +ve

D. $T \Delta S > \Delta H$ and both ΔH and ΔS are +ve

Answer: D

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96. For a phase change $H_2O(l) \rightleftharpoons H_2O(s)$

$0^\circ C, 1 \text{ bar}$

A. $\Delta G=0$

B. $\Delta S=0$

C. $\Delta H=0$

D. $\Delta U=0$

Answer: A

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97. In which condition entropy change is not zero ?

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98. What is the relationship between free energy change and enthalpy change a reaction ?

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99. Give two examples of extensive property.

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100. Give examples of macroscopic properties.

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101. what are the units of work and energy and how they are related ?

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102. Write the factors which affect the enthalpy change of a reaction.

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103. Explain enthalpy.

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104. Define enthalpy of neutralization.

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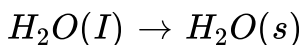
105. State Hess's law of constant heat summation.

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106. Write the relation between heat of sublimation, heat of fusion, heat of vapourisation.

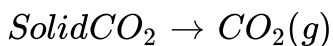
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107. Write the sign of ΔS for the following changes.



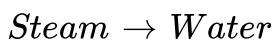
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108. Write the sign of ΔS for the following changes



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109. Write the sign of ΔS for the following changes



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110. What is the sign of ΔH in exothermic and endothermic reaction ?

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111. Explain "free energy".

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112. Explain why entropies of all pure substances at absolute zero are zero.

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113. Explain the state of chemical reaction.

$$\Delta G = 0$$

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114. Explain the state of chemical reaction.

$$\Delta G < 0$$

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115. Explain the state of chemical reaction.

$$\Delta G > 0$$

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116. Write down the expressions for standard free energy change in terms of equilibrium constant.

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117. What is the relationship between enthalpy (H) and internal energy (E) ?

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118. Define Hess's law.

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119. For a spontaneous process how $T \Delta S$ and ΔH are related ?

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120. What are the factors on which internal energy depends ?

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121. What is the value of ΔG , when a reaction takes place at constant temperature and pressure?

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122. Calculate the entropy of vaporisation for liquid boiling at 300K having enthalpy of vapourisation, 27kJ mol^{-1} .

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123. Write Gibb's Helmholtz equation ?

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124. Why $\Delta G < 0$ is always true for a spontaneous reaction ?

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125. The heat of combustion of $C_{10}H_8(s)$ at constant volume is -5133kJ mol^{-1} at 298K. Calculate the value of enthalpy change.
($R = 8.314\text{JK}^{-1}\text{mol}^{-1}$)

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126. Calculate the entropy of vaporisation for liquid boiling at 300K having enthalpy of vapourisation, 27kJ mol^{-1} .

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127. The equilibrium constant for the reaction is 10 at 300K. What will be the value of ΔG° ?

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128. Explain the latest sign conventions regarding work and heat as per IUPAC recommendation.

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129. What would be the heat released when 0.5 mole of HCl is neutralised by 0.5 mole of NaOH in aqueous solution.

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130. The enthalpy of combustion of CH_4 at $25^\circ C$ is 890kJ. How much heat liberated when 3.2g of methane is burnt in air ?

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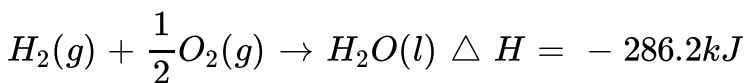
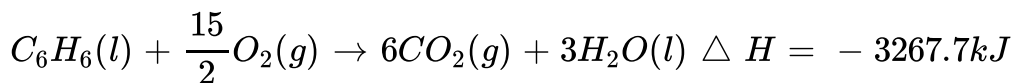
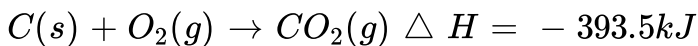
131. Define Hess's law.

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132. Calculate the entropy change when 1 gram of ice is converted to water. Given $\Delta H = 6025 \text{ J/mole}$

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133. Calculate the heat of formation of benzene from the following data.



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134. The enthalpy of combustion of glucose is -2840 kJ. What is the energy evolved for the combustion of 5.2 gm of glucose ?

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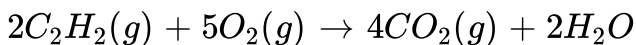
135. What do you mean by internal energy ?

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136. Explain the significance of change of enthalpy.

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137. Calculate the enthalpy change (ΔH) for the following reaction.



Given : Average bond energies of various bonds C-H, $C \equiv C$, O=O, C=O, O-H are 414, 814, 499, 724, 640 kJ mol^{-1} respectively.

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138. The standard free energy change for a reaction is $-212.3 \text{ kJ mol}^{-1}$. If the enthalpy of the reaction is $216.7 \text{ kJ mol}^{-1}$, calculate the change in entropy in the reaction at 298K.

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139. Prove that $\Delta H = \Delta U + \Delta nRT$.

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140. What are the required thermodynamic criteria for a reaction to be spontaneous ?

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141. Under what condition, enthalpy change is equal to heat of reaction ?

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142. The standard heat of formation of diamond, although an elementary substance, is not taken as zero. Explain why ?

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143. Are the bond energies of all the four C-H bonds in methane molecule equal ? Justify your answer.

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144. Why is entropy of substance taken as zero at absolute zero temperature ?

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145. What is the value of change in entropy at equilibrium ?

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146. Neither q nor w is a state function but $(q+w)$ is a state function.

Explain why ?

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147. Arrange water vapour, liquid water and ice in the order of increasing entropy.

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148. Why does a real crystal has more entropy than an ideal crystal ?

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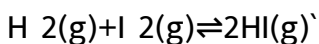
149. How does entropy change with increase in temperature,

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150. How does entropy change with decrease in pressure ?

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151. Do you expect $\Delta S \rightarrow$ *be + ve, - ve or zero* of *reaction:*



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152. Is the entropy of the universe constant ?

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153. What is mean by macroscopic properties in thermodynamics ?

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154. Define intensive properties and give few examples.

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155. How can you convert an extensive property to an intensive property ?

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156. Give relation between internal energy change and enthalpy change.

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157. What are the standard states for various form of matter ?

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158. Define and illustrate standard enthalpy of reaction.

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159. Define and illustrate standard enthalpy of formation.

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160. What is enthalpy of solution ?

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161. What is bond energy ?

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162. Define and illustrate bond dissociation energy.

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163. How can bond enthalpy data can be used to calculate enthalpy of reaction ?

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164. State Zeroth law of thermodynamics.

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165. Give four statements of first law of thermodynamics.

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166. Give four limitations of first law of thermodynamics.

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167. Define heat capacity of a system and give relationship between C_p and C_v .

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168. Give relation between C_p and C_v .

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169. Give Kirchhoff's equation at constant pressure and constant temperature.

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170. Show that maximum work is done in isothermal reversible expansion.

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171. Give an expression for work done in a reversible isothermal expansion of an ideal gas.

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172. How much work is done in an irreversible isothermal free expansion of an ideal gas in vacuum ?



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173. For reversible adiabatic expansion of an ideal gas, give an expression for work done.



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174. what is Joule Thomson Coefficient ? How does it account for the heating and cooling effect on J.T. expansion ?



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175. Define intensive property and show its importance.



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176. What is the efficiency of a heat engine ?

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177. How is entropy change measured in a reversible isothermal process ?

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178. Give four different statements of second law of thermodynamics.

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179. Explain why the enthalpy of formation and the entropy of formation of an element in its standard state at 298 K and 1 bar pressure are not equal ?



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180. State third law of thermodynamics with few exceptions.

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181. Give relationship between entropy and probability.

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182. What is integral enthalpy solution ?

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183. What is molar integral enthalpy of solution ?

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184. Define molar differential enthalpy of solution.

 [Watch Video Solution](#)

185. Explain the significance of molar enthalpy of solution at infinite dilution.

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186. What is integral enthalpy of dilution ?

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187. Explain molar integral enthalpy of dilution.

 [Watch Video Solution](#)

188. Define molar differential enthalpy of dilution.

 [Watch Video Solution](#)

189. State and explain Nernst heat theorem.

 [Watch Video Solution](#)

190. State third law of thermodynamics, what is the importance of this law ?

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191. When water is converted to ice, its entropy_____.

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192. Heat of combustion is also known as _____.

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193. In endothermic reaction Δ is _____ and in exothermic reaction ΔH is _____.

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194. What is the relationship between enthalpy (H) and internal energy (E) ?

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195. Measurement of disorderness or randomness of the system is _____.



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196. The enthalpy change during chemical reaction remains the same whether the reaction takes place in one step or in several steps is known as _____.



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197. Gibb's Helmholtz equation is _____.



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198. What is the free energy change at equilibrium state ?



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199. The energy required to break down all the bonds in one compound is known as _____.

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200. Ice is converted to water, then entropy _____.

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201. Entropy of ice is _____ than entropy of water vapour.

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202. For spontaneous process ΔS is _____ and ΔG is _____.

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203. The system in which exchange of both matter and energy with surroundings takes place is known as_____.

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204. The properties which do not depend on the quantity of matter present in the system are called_____.

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205. Number of moles, mass, volume, enthalpy, entropy and free energy are examples of _____ properties.

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206. All natural processes are _____ process.



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207. S.I. Unit of caloric value is given by_____.

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208. Entropy is a measure of disorder. For perfect crystalline substance at 0 K, entropy becomes:

- A. Minus
- B. Zero
- C. Constant
- D. Very low

Answer: B

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209. For the reversible vaporisation of water at 100°C and 1 atmospheric pressure, ΔG is equal to:

A. ΔH

B. ΔS

C. zero

D. $\Delta \frac{H}{T}$

Answer: C



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210. The total amount of energy in the universe is fixed, but:

A. Matter is increasing

B. Gravitation is decreasing

C. Disorder is increasing

D. Lightening is increasing

Answer: C

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211. Gibbs free energy G , enthalpy H and entropy S are related by:

A. $G=H+TS$

B. $G=H-TS$

C. $G-TS=H$

D. $S=H-G$

Answer: B

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212. For the precipitation of AgCl by Ag^+ ions and HCl:

A. $\Delta H = 0$

B. $\Delta G = 0$

C. $\Delta G = -ve$

D. $\Delta H = \Delta G$

Answer: C

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213. Least random state of water is:

A. Ice

B. Liquid water

C. Steam

D. All present in same random state

Answer: A

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214. The matter has highest entropy in:

A. Solid state

B. Liquid state

C. Gaseous state

D. Equal in all

Answer: C

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215. In a reversible isothermal process the change in internal energy is:

- A. Zero
- B. Positive
- C. Negative
- D. None

Answer: A



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216. The total entropy change for a system and its surrounding increases, if the process is

- A. reversible
- B. irreversible

C. exothermic

D. endothermic

Answer: B



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217. When the value of entropy is greater, then the ability for work is:

A. Maximum

B. Minimum

C. Medium

D. None of these

Answer: A



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218. A well stopped thermosflask contains some ice Cubes. This is an example of a

- A. Closed system
- B. Open system
- C. Isolated system
- D. None

Answer: C

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219. Change in entropy is negative for:

- A. $Br_{(l)} \rightarrow Br_{(g)}$
- B. $C(s) + H_2O(g) \rightarrow CO(g) + H_2(g)$
- C. $N_2(g, 10atm) \rightarrow N_2(g, 1atm)$

D. $Fe(1mol, 400K) \rightarrow Fe(1mol, 300K)$

Answer: D

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220. At a certain temperature T , the endothermic reaction $A \rightarrow B$ proceeds almost to completion.

The entropy change is:

A. $\Delta S = 0$

B. $\Delta S < 0$

C. $\Delta S > 0$

D. Cannot be predicted

Answer: C

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221. The enthalpy change for the process $C(s) \rightarrow C(g)$ corresponds to enthalpy of:

- A. Fusion
- B. Vaporisation
- C. Combustion
- D. Sublimation

Answer: D



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222. For the process, $CO_2(s) \rightarrow CO_2(g)$:

- A. Both ΔH and ΔS are +ve
- B. ΔH is negative and ΔS is +ve`
- C. ΔH is +ve and ΔS is -ve`

D. Both ΔH and ΔS are -ve`

Answer: A

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223. Maximum work done by a system is given by:

A. Decrease in Helmholtz free energy (ΔA)

B. Decrease in Gibb's free energy (ΔG)

C. Decrease in internal energy

D. Decrease in heat energy

Answer: B

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224. The final temperature in an adiabatic expansion is:

- A. Greater than the initial temperature
- B. Same as the initial temperature
- C. Half of the initial temperature
- D. Less than the initial temperature

Answer: D

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225. In an adiabatic process:

- A. The system exchanges heat with surrounding
- B. Pressure is maintained constant
- C. There is perfect heat insulation

D. The gas is isothermally expanded

Answer: C

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226. The work done by a system in an expansion against a constant external pressure is :

A. $\Delta P \cdot \Delta V$

B. $-P \cdot \Delta V$

C. Q

D. $V \cdot \Delta P$

Answer: B

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227. An endothermic reaction is one in which

- A. Heat is liberated
- B. heat is absorbed
- C. Temperature remains constant
- D. None of these

Answer: B

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228. The mathematical form of the first law of thermodynamics when heat(q) is supplied and W is work done by the system(+ve) is:

- A. $\Delta U = q + W$
- B. $\Delta U = q - W$
- C. $\Delta U = -q + W$

D. $\Delta U = -q - W$

Answer: B

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229. Which one is not a state function:

A. Internal energy(U)

B. Volume

C. Heat (q)

D. Enthalpy

Answer: C

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230. Thermodynamic is concerned with:

- A. Total energy of a system
- B. Energy changes in a system
- C. Rate of chemical change
- D. Mass change in nuclear reactions

Answer: B

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231. When no heat energy is allowed to enter or leave the system it is called:

- A. Isothermal process
- B. Reversible process
- C. Adiabatic process

D. Irreversible process

Answer: C

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232. The ΔG in the process of melting of ice at $-156^\circ C$ is:

A. $\Delta G < 0$

B. $\Delta G > 0$

C. $\Delta G = 0$

D. All

Answer: B

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233. The entropy change for vaporisation of liquid water to steam at $100^{\circ}C$ is _____ $JK^{-1}mol^{-1}$, Given that heat of vaporisation is $40.8kJmol^{-1}$.

A. 109.38

B. 100.38

C. 110.38

D. 120.38

Answer: A

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234. The work done by 100 calorie of heat is:

A. 481.4 J

B. 4.184J

C. 41.84J

D. None

Answer: A



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235. The work done by a system is 8 J, when 40 J heat is supplied to it.

The change in internal energy of the system during the process:

A. 32 J

B. 40 J

C. 36 J

D. 44 J

Answer: A



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236. The work done during the process when 1 mole of gas is allowed to expand freely into vacuum is:

- A. Zero
- B. +ve
- C. -ve
- D. Either of these

Answer: A

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237. The maximum work done in expanding 16 g oxygen at 300K and occupying a volume of 5 dm^3 isothermally until the volume become 25 dm^3 is:

- A. $2.01 \times 10^3 \text{ J}$

B. $+2.81 \times 10^3 J$

C. $2.01 \times 10^{-3} J$

D. $+2.01 \times 10^{-6} J$

Answer: A



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238. If temperature remains constant during a reaction the process is called:

A. Isothermal

B. Isochoric

C. Isobaric

D. Adiabatic

Answer: A

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239. A gaseous system change form state A $(P_1, V_1, T_1) \rightarrow B(P_2, V_2, T_2)$, $B \rightarrow C(P_3, V_3, T_3)$ and finally from C to A. The whole procoess may be called:

- A. Reversible process
- B. Cyclic process
- C. Isobaric process
- D. Spontaneous process

Answer: B

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240. Work done by the system on surrounding is

- A. Postive
- B. Negative
- C. Zero
- D. None of these

Answer: B



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241. During isothermal transformation of an ideal gas, internal energy:

- A. Increase as the pressure increases
- B. Decreases as the volume decreases
- C. Decreases as the pressure decreases
- D. remains fixed

Answer: D

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242. When a solid is changed into liquid the entropy

- A. Decrease
- B. Increases
- C. Remains constant
- D. None of these

Answer: B

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243. Write van't Hoff equation ?

A. $\Delta G = RT \log_g K_p$

B. $-tr \in ag \leq G = RT \log_g K_p$

C. $\Delta G = RT^2 \in K_p$

D. None of these

Answer: B



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244. 1 litre - atmosphere is equal to:

A. 101.3 J

B. 24.206 cal

C. $101.3 \times 10^7 \text{ erg}$

D. All

Answer: D



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245. Decrease in free energy of a reacting system indicates to:

- A. Exothermic reaction
- B. Equilibrium reaction
- C. Spontaneous reaction
- D. Slow reaction

Answer: C



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246. An ideal gas undergoing expansion in vacuum shows:

- A. $\Delta U = 0$
- B. $W=0$

C. $q=0$

D. All

Answer: D



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247. It is impossible to attain the lowest temperature known as zero degree absolute. This is a simple statement of:

- A. First law of thermodynamics
- B. Second law of thermodynamics
- C. Third law of thermodynamics
- D. None

Answer: C



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248. An example of extensive property is:

- A. Temperature
- B. Internal energy
- C. Viscosity
- D. Surface tension

Answer: B



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249. It is a general principle that the less energy of a system then it is:

- A. More stable
- B. Less stable

C. Unstable

D. More unstable

Answer: A

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250. ΔS for the reaction,

$MgCO_3(s) \rightarrow MgO(s) + CO_2(g)$ will be

A. Zero

B. $-ve$

C. $+ve$

D. ∞

Answer: C

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251. The intensive property is:

- A. Freezing point
- B. Temperature
- C. Refractive index
- D. All

Answer: D



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252. An isolated system is that system in which:

- A. There is no exchange of energy with the surroundings
- B. There is exchange of mass and energy with the surroundings
- C. There is no exchange of mass or energy with the surroundings

D. There is exchanges of mass with the surroundings

Answer: C

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253. For two mole of an ideal gas:

A. $(C_p - C_v) = R$

B. $(C_p - C_v) = \frac{R}{2}$

C. $(C_v - C_p) = -2R$

D. $(C_p - C_v) = 0$

Answer: A

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254. When an ideal gas is compressed adiabatically and reversibly, the final temperature is:

- A. Higher than the initial temperature
- B. Lower than the initial temperature
- C. The same as the initial temperature
- D. Dependent on the rate of compression

Answer: C

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255. Above the inversion temperature, μ (J.T. coefficient):

- A. Is positive
- B. Is zero
- C. Is negative

D. Depends on the gas

Answer: C

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256. For the adiabatic expansion of an ideal gas:

A. $PV^\gamma = \text{constant}$

B. $TV^{\gamma-1} = \text{constant}$

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

D. All

Answer: D

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257. The inversion temperature for a van der Waals' gas is:

A. $T_i = 2\frac{a}{Rb}$

B. $T_i = \frac{a}{Rb}$

C. $T_i = \frac{a}{2}(Rb)$

D. $T_i = 0.5T_{Boyle}$

Answer: A

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258. Which is not a spontaneous process:

A. Expansion of a gas into vacuum

B. Water flowing down hill

C. Heat flowing from colder body to a hotter body

D. Evaporation of water from clothes during drying

Answer: C

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259. The equilibrium constant for the reaction is 10 at 300K. What will be the value of ΔG° ?

A. Standard free energy change ΔG°

B. temperature T

C. Heat enthalpy

D. None

Answer: A

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260. When ice melts into water, entropy:

- A. becomes zero
- B. Decreases
- C. increases
- D. Remains the system

Answer: C



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261. Human body is an example of:

- A. Open system
- B. Closed system
- C. Isolated system
- D. None

Answer: B

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262. A closed flask contains water in all its three states, solids, liquid and vapour at $0^{\circ}C$. In this situation the average KE of the water molecule will be:

- A. Maximum in vapour state
- B. Maximum in solid state
- C. Greater in the liquid than in vapour state
- D. Same in all the three states

Answer: D

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263. Which gas shows a heating effect when expanded into a region of low pressure:

A. O_2

B. NH_3

C. F_2

D. H_2

Answer: D



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264. On dissolving NaCl in water there occurs:

A. becomes zero

B. Increases in entropy

C. Decrease in entropy

D. No change in entropy

Answer: B

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265. When hydrogen and oxygen burn to form water in an oxyhydrogen torch, the entropy change is:

A. Negative

B. Positive

C. Zero

D. may be +ve or -ve

Answer: A

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266. Joule Thomson co-efficient for ideal gas is:

- A. Zero
- B. Positive
- C. Negative
- D. Infinite

Answer: A

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267. ΔS is positive for the change:

- A. Mixing of two gases
- B. Boiling of liquid
- C. Melting of Solid
- D. All

Answer: D



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268. The heat change in a chemical reaction at constant pressure is:

A. ΔH

B. ΔU

C. ΔT

D. ΔV

Answer: A



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269. A thermally isolated gaseous system can exchange energy with the surrounding. The mode of transference of energy can be:

A. Heat

B. Work

C. Heat and radiation

D. None of these

Answer: B



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270. Which correctly represents the physical significance of free energy change:

A. $\Delta G = W_{\text{expansion}}$

B. $\Delta G = W_{\text{no expansion}}$

C. $\Delta G = -W_{\text{compression}}$

D. $\Delta G = W_{\text{compression}}$

Answer: C

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271. A reaction taking place with absorption of energy is:

- A. Burning of a candle
- B. Electrolysis of water
- C. Digestion of food
- D. Rusting of iron

Answer: B

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272. All the naturally occurring processes i.e., spontaneous proceed spontaneously in a direction which leads to:

A. Decrease of free energy

B. Increase of free energy

C. Decrease of entropy

D. Increase of entropy

Answer: A



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273. Work done by the system in a cyclic process is equal to:

A. Zero

B. ΔU

C. ΔH

D. q

Answer: D



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274. Internal energy of an ideal gas depends on:

- A. Pressure
- B. Temperature
- C. Volume
- D. None

Answer: B



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275. A spontaneous change is one in which the system suffers:

- A. An increase in internal energy
- B. A lowering of entropy

C. A lowering of free energy

D. No energy

Answer: C



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276. Heat given to a system under isochoric process is equal to:

A. W

B. q_p

C. ΔE

D. ΔH

Answer: A



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277. The apparatus generally used for measuring heat changes is:

- A. Voltameter
- B. Voltmeter
- C. Calorimeter
- D. Coulometer

Answer: C

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278. In which of the following case entropy decreases:

- A. Solid changing to liquid
- B. Expansion of a gas
- C. Crystals dissolve
- D. Polymerisation

Answer: D

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279. In which case, a spontaneous reaction is impossible at any temperature:

A. $\Delta H > 0, \Delta S > 0$

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

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

D. In all cases

Answer: B

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280. In which case, a spontaneous reaction is possible at any temperature:

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

B. $\Delta H < 0, \Delta S < 0$

C. $\Delta H > 0, \Delta S > 0$

D. In none of the cases

Answer: A



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281. In a reaction, ΔH and ΔS both are more than zero. In which of the following cases, the reaction would not be spontaneous:

A. $\Delta H > T \Delta S$

B. $\Delta S = \Delta \frac{H}{T}$

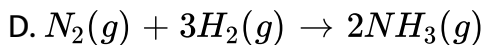
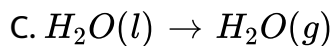
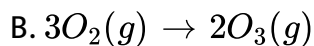
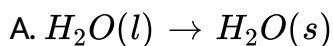
C. $\Delta H = T \Delta S$

D. All

Answer: D

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282. In which reaction ΔS is positive:



Answer: C

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283. Change in entropy for a reaction is given by:

A. $2.303 nR \frac{\log_{10}(v_2)}{v_1}$

B. $nR \frac{\log_e(v_2)}{v_1}$

C. $nR \frac{\log_e(P_1)}{P_2}$

D. All

Answer: D

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284. The efficiency of heat engine is maximum when:

A. Temperature of source greater than temperature of sink

B. Temperature of sink greater than temperature of source

C. Temperature difference of source and sink is minimum

D. Temperature difference of source and sink is maximum

Answer: D

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285. In a chemical reaction $\Delta H=150\text{kJ}$ and $\Delta S= 100\text{JK}^{-1}$ at 300K . The ΔG° for the reaction is :

- A. Zero
- B. 300 kJ
- C. 330 kJ
- D. 120 kJ

Answer: D

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286. A system is provided 50 joule of heat and work done on the system is 10 J. The change in internal energy during the process is:

A. 40 J

B. 60 J

C. 80 J

D. 50 J

Answer: B



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287. Enthalpy of vaporisation for water is $186.5 \text{ kJ mol}^{-1}$. The entropy change during vaporisation is ___ $\text{kJ K}^{-1} \text{mol}^{-1}$:

A. 0.5

B. 1

C. 1.5

D. 2

Answer: A



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288. A system is changed from state A to state B by one path and from B to A by another path. If U_1 and U_2 are the corresponding change in internal energy, then:

A. $U_1 + U_2 = +ve$

B. $U_1 + U_2 = -ve$

C. $U_1 + U_2 = 0$

D. None

Answer: C



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289. The cooling in refrigerator is due to:

- A. The work of compressor
- B. The expansion of gas in the refrigerator
- C. Expansion of ice
- D. Reaction of the refrigerator

Answer: B

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290. If $\Delta G^\circ > 0$, for a reaction then:

- A. $K_p > 1$
- B. $K_p < 1$

C. The products predominate in the equilibrium mixture

D. None

Answer: B



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291. Highest entropy at the same temperature is in:

A. Water

B. Hydrogen

C. Mercury

D. Graphite

Answer: B



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292. During an adiabatic process:

- A. Pressure is maintained constant
- B. Gas is isothermally expanded
- C. There is perfect heat insulation
- D. The system change heat with surroundings

Answer: C

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293. The process in which pressure remains constant throughout a change is:

- A. Adiabatic
- B. Isochoric
- C. Isobaric

D. Isothermal

Answer: C

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294. Which statements is/are correct:

A. $(\delta H / \delta T)_p - (\delta U / \delta T)_v = R$

B. $(\delta H / \delta T)_p > (\delta U / \delta T)_v$

C. $(\delta E / \delta V)_T$ for ideal gas is zero

D. All

Answer: D

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295. In an irreversible process, the value of $\Delta S_{system} + \Delta S_{urr}$ is :

- A. greater than 0
- B. less than 0
- C. equal 0
- D. All

Answer: A

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296. The entropy change at a given temperature is expressed as:

- A. $\Delta S = q - T$
- B. $\Delta S = q / \Delta T$
- C. $q = T \Delta S$

D. $S=q/T$

Answer: C

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297. The temperature of the system increases during an:

A. Isothermal expansion

B. Adiabatic compression

C. Adiabatic expansion

D. Isothermal compression

Answer: B

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298. Enthalpy is same as:

A. Heat content

B. Entropy

C. Heat

D. Volume

Answer: A

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299. The relation $\Delta G = \Delta H - T \Delta S$ was given by

A. Boltzmann

B. Faraday

C. Gibbs-Helmholtz

D. Thomson

Answer: C

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300. Entropy decreases during:

A. Crystallisation of sucrose from solution

B. Rusting of iron

C. Melting of ice

D. Vaporisation of camphor

Answer: A

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301. The spontaneous nature of a reaction is impossible if:

A. ΔH is +ve, ΔS is also +ve

B. ΔH is -ve, ΔS is also -ve

C. ΔH is -ve, ΔS is +ve

D. ΔH is +ve, ΔS is -ve

Answer: D

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302. For an adiabatic process :

A. $Q=+w$

B. $Q=0$

C. $\Delta E = q$

$$D. P \triangle V = 0$$

Answer: B

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303. Energy equivalent to one erg, one joule and one calorie are in order:

A. 1 erggt1 Jgt1 cal

B. 1 erggt1 calgt1 J

C. 1 calgt 1 Jgt1 erg

D. 1 Jgt1 cal gt 1 erg

Answer: C

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304. A boiled egg show a/an_ in entropy:

- A. Increase
- B. Decreases
- C. No change
- D. None

Answer: A

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305. Molar heat capacity at constant P for substance is equal to:

- A. $(\delta E / \delta T)_v$
- B. $(\delta H / \delta T)_v$
- C. $(\delta E / \delta T)_p$
- D. $(\delta H / \delta T)_p$

Answer: D

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306. The work done by a weightless piston in causing an expansion ΔV (at constant temperature), when the opposing pressure, P is variable, is given by:

A. $W = - \int P \Delta V$

B. $W=0$

C. $W = - P \Delta V$

D. None

Answer: A

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307. An adiabatic process is one in which:

- A. The system is not closed to energy transfer
- B. The system is not closed to heat transfer
- C. There is no enthalpy change
- D. There is no change in mass of the system

Answer: C

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308. Which is the intensive property:

- A. Temperature
- B. Viscosity
- C. Density

D. All

Answer: D

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309. Warming ammonium chloride with sodium hydroxide in a test tube is an example of:

- A. Closed system
- B. Isolated system
- C. Open system
- D. None of these

Answer: C

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310. The unit of entropy are:

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

B. $kJ^{-1}mol^{-1}$

C. $kJmol^{-1}$

D. $J^{-1}K^{-1}mol^{-1}$

Answer: A

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311. At absolute zero, the entropy of a perfect crystal is zero. This is which law of thermodynamics ?

A. First law of thermodynamics

B. Second law

C. Third law

D. None

Answer: C

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312. Net work done by a system is given by:

A. Decrease in Helmholtz free energy (ΔA)

B. Decrease in Gibb's free energy (ΔG)

C. Decrease in internal energy

D. Decrease in heat enthalpy

Answer: A

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313. The process of evaporation of a liquid is accompanied by:

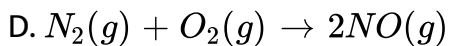
- A. Increase in enthalpy
- B. Decrease in free energy
- C. Increase in entropy
- D. All

Answer: D

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314. ΔS° will be highest for the reaction

- A. $Ca(s) + 1/2O_2(g) \rightarrow CaO(S)$
- B. $CaCO_3(S) \rightarrow CaO(s) + CO_2(g)$
- C. $C(s) + O_2(g) \rightarrow CO_2(g)$



Answer: B

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315. The free energy change for a reversible reaction at equilibrium is:

- A. Zero
- B. Small positive
- C. Small negative
- D. Large positive

Answer: A

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316. Which is not a state function:

A. Internal energy

B. Entropy

C. Work

D. Enthalpy

Answer: C



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317. The temperature of the system decreases in an:

A. Adiabatic expansion

B. Isothermal compression

C. Isothermal expansion

D. Adiabatic compression

Answer: A



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318. The second law of thermodynamic introduced the concept of:

- A. Third law of thermodynamics
- B. Work
- C. Entropy
- D. Internal energy

Answer: C



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319. Select the correct limitations of III law of thermodynamics:

- A. Glassy solids at zero Kelvin has entropy greater than zero
- B. Solids having mixture of isotopes do not have entropy zero at Kelvin
- C. Crystals of CO , N_2O , NO , H_2O , etc., do not have zero entropy at zero Kelvin.
- D. All

Answer: D

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320. Which of the following have same units:

(i) Work, (ii) Heat, (iii) Energy (iv) Entropy

A. (i), (ii) and (iii)

B. (i), (ii) and (iv)

C. (ii), (iii) and (iv)

D. (iii) and (iv)

Answer: A



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321. When two atoms of hydrogen combine to form a molecule of hydrogen gas, the energy of the molecule is:

A. Greater than that of separate atoms

B. Equal to that of separate atoms

C. Lower than that of separate atoms

D. Sometimes lower than sometimes higher

Answer: C



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322. A gas on subjecting to adiabatic expansion gets cooled due to:

- A. Fall in temperature
- B. Loss of Kinetic energy
- C. Decrease in velocity
- D. Energy used in doing work

Answer: D

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323. In a spontaneouse irreversible process, the total entropy of the system and surroundings:

- A. Remains constant
- B. Increases

C. Decreases

D. Zero

Answer: B



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324. If a refrigerator door is opened then we get

A. Room cooled

B. Room heated

C. more heat is passed out

D. no effect on room

Answer: B



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325. During isothermal expansion of an ideal gas its

A. $Q=0$

B. $\Delta V = 0$

C. $W=0$

D. $\Delta U = 0$

Answer: D



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326. A gas expands isothermally and reversibly. The work done by the gas is:

A. Zero

B. Minimum

C. Maximum

D. Equal to work done

Answer: C

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327. Temperature and heat are:

A. Extensive properties

B. Intensive properties

C. Intensive and extensive properties respectively

D. Extensive and intensive properties respectively

Answer: C

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328. Internal energy and pressure of a gas of unit volume are related as:

A. $P = 2/3U$

B. $P = 3/2U$

C. $P = U/2$

D. $P=2U$

Answer: A

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329. The internal energy of one mole of a gas is:

A. $3/2RT$

B. $KT/2$

C. $RT/2$

D. $3KT/2$

Answer: A

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330. The heat measured for a reaction in a bomb calorimeter is:

A. ΔG

B. ΔH

C. ΔU

D. $P \Delta V$

Answer: C

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331. Give an expression for work done in a reversible isothermal expansion of an ideal gas.

A. $2.303RT \log \frac{V_2}{V_1}$

B. $\frac{nR}{(\gamma - 1)}(T_2 - T_1)$

C. $2.303RT \log \frac{P_2}{P_1}$

D. None

Answer: A

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332. Work done in reversible adiabatic process is given by:

A. $2.303RT \log \frac{V_2}{V_1}$

B. $\frac{nR}{(\gamma - 1)}(T_2 - T_1)$

C. $2.303RT \log \frac{V_1}{V_2}$

D. None

Answer: B

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333. The bond dissociation energy of C-H bond in CH_4 from the equation,

$C(g) + 4H(g) \rightarrow CH_4, \Delta H = -397.8 \text{ kcal}$ is:

A. $+ 397.8 \text{ kcal}$

B. $+ 198.9 \text{ kcal}$

C. $+ 99.45 \text{ kcal}$

D. $- 99.45 \text{ kcal}$

Answer: D

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334. The enthalpy of formation of water from hydrogen and oxygen is -286 kJ mol^{-1} . The enthalpy of decomposition of water into hydrogen and oxygen is:

A. -286 kJ mol^{-1}

B. -143 kJ mol^{-1}

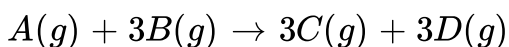
C. $+286 \text{ kJ mol}^{-1}$

D. $+143 \text{ kJ mol}^{-1}$

Answer: C

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335. For a gaseous reaction,



ΔU is 17 kcal at 27°C . Assuming $R = 2 \text{ cal K}^{-1} \text{ mol}^{-1}$, the value of ΔH for the above reaction will be:

A. 15.8 kcal

B. 16.4 kcal

C. 18.2 kcal

D. 20.0 kcal

Answer: C

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336. The heat of combustion of methane is, -880 kJ mol^{-1} . If 3.2 g of methane is burnt:

A. 176 kJ of heat is evolved

B. 176 kJ of heat is absorbed

C. 88 kJ of heat is evolved

D. None of the above

Answer: A

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337. If $H_2(g) + Cl_2(g) \rightarrow 2HCl, \Delta H = -44 \text{ kcal}$
 $2Na(s) + 2HCl(g) \rightarrow 2NaCl(s) + H_2(g), \Delta H = -152 \text{ kcal}$ then, $Na(s) + 0.5Cl_2(g) \rightarrow NaCl(s), \Delta H = ?$

A. 108 kcal

B. 196 kcal

C. -98 kcal

D. 54 kcal

Answer: B

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338. The heat of formation of $\text{CO}(g)$ and $\text{CO}_2(g)$ are -26.4 kcal and -94.0 kcal respectively. Heat of combustion of carbon monoxide will be:

A. $+ 26.4 \text{ kcal}$

B. $- 67.6 \text{ kcal}$

C. $- 120.6 \text{ kcal}$

D. $+ 52.8 \text{ kcal}$

Answer: B

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339. The standard heat of formation of $\text{NO}_2(g)$ and $\text{N}_2\text{O}_4(g)$ are 8.0 and $2.0 \text{ kcal mol}^{-1}$ respectively. The heat of dimerization of NO_2 in kcal is:

A. 10

B. -6.0

C. -12.0

D. -14.0

Answer: D

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340. Given enthalpy of formation of $CO_2(g)$ and $CaO(s)$ are -94.0 kJ and -152 kJ respectively and the enthalpy of the reaction, $CaCO_3(s) \rightarrow CaO(s) + CO_2(g)$ is 42 kJ. The enthalpy of formation of $CaCO_3(s)$ is:

A. $-42kJ$

B. $-202kJ$

C. $+202kJ$

D. -288kJ

Answer: D

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341. The heat of combustion of rhombic and monoclinic sulphur are 70.96 and 71.03 kcal. The heat of transition of $S_{R \rightarrow M}$ is:

A. 70.96 kcal

B. 71.03 kcal

C. -70cal

D. $+70\text{cal}$

Answer: D

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342. The heat of combustion for C , H_2 and CH_4 are -349.0, -241.8 and -906.7 kJ respectively. The heat of formation CH_4 is:

- A. 174.1 kJ
- B. 274 kJ
- C. 374.1 KJ
- D. 74.1 kJ

Answer: D



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343. Δn , the change in the number of mole for the reaction,
 $C_{12}H_{22}O_{11}(s) + 12O_2(g) \rightarrow 12CO_2(g) + 11H_2O(l)$ at $25^\circ C$ is

- A. Zero
- B. -1

C. 2

D. 4

Answer: A



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344. The enthalpy change of a reaction does not depend on:

A. State of reactants and products

B. Nature of reactants and products

C. Different intermediate reaction

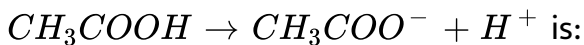
D. Initial and final enthalpy change of reaction

Answer: C



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345. The ΔH for the process,



- A. Positive
- B. Negative
- C. Zero
- D. Unpredictable

Answer: A

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346. The bond energies of F_2 , Cl_2 , Br_2 and I_2 are 155.4, 243.6, 193.2 and 151.2 kJ mol^{-1} respectively. The strongest bond is:

- A. F-F
- B. Cl-Cl

C. Br-Br

D. I-I

Answer: B

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347. For the reaction, $N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$, which is true:

A. $\Delta H = \Delta U$

B. $\Delta H < \Delta U$

C. $\Delta H > \Delta U$

D. None

Answer: B

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348. Hess's law is related to:

- A. Change in heat during of reaction
- B. Rates of reaction
- C. equilibrium constant
- D. influence of pressure on volume of a gas

Answer: A

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349. The heat released during neutralisation is constant for the reaction of aqueous solutions of:

- A. Strong acid and strong base
- B. Strong acid and weak base
- C. Strong base and weak acid

D. In all the cases

Answer: A

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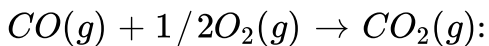
350. Evaporation of water is:

- A. An exothermic change
- B. An endothermic change
- C. A process where no heat change occurs
- D. A process accompanied by chemical change

Answer: B

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351. At constant P and T which statement is correct for the reaction,



A. $\Delta H = \Delta U$

B. $\Delta H < \Delta U$

C. $\Delta H > \Delta U$

D. ΔH is independent for physical state of reaction.

Answer: B



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352. The difference between ΔH and ΔU is equal to:

A. R

B. $P \Delta V$

C. $V \Delta P$

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

Answer: B

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353. 1 mole of gas occupying 3 litre volume is expanded against a constant external pressure of 1 atm to a volume of 15 litre . The work done by the system is:

A. $1.215 \times 10^3 J$

B. $12.15510^3 J$

C. $1.215 \times 10^3 J$

D. None

Answer: A

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354. For a reaction at $25^{\circ}C$ enthalpy change (ΔH) and entropy change (ΔS) are $-11.7 \times 10^3 J mol^{-1}$ and $-105 J mol^{-1} K^{-1}$ respectively. The reaction is:

- A. Spontaneous
- B. Non-Spontaneous
- C. Instantaneous
- D. None

Answer: B

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355. 1 mole of an ideal gas at $25^{\circ}C$ is subjected to expand reversibly ten times of its initial volume. The change in entropy of expansion is:

- A. $19.15 JK^{-1} mol^{-1}$

B. $16.15JK^{-1}mol^{-1}$

C. $22.15JK^{-1}mol^{-1}$

D. None

Answer: A

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356. The entropy change for the reaction given below is:

$2H_2(g) + O_2(g) \rightarrow 2H_2O(l)$ is __ at 300K. Standard entropies of $H_2(g)$, $O_2(g)$ and $H_2O(l)$ are 126.6, 201.20 and $68.0JK^{-1}mol^{-1}$ respectively.

A. $-318.4JK^{-1}mol^{-1}$

B. $318.4JK^{-1}mol^{-1}$

C. $31.84JK^{-1}mol^{-1}$

D. None

Answer: A

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357. The temperature at which the reaction,
 $Ag_2O(s) \rightarrow 2Ag(s) + I/2O_2(g)$ is at equilibrium is....., Given
 $\Delta H=30.5 \text{ kJ mol}^{-1}$ and $\Delta S=0.066 \text{ kJ K}^{-1}\text{mol}^{-1}$:

A. 462.12 K

B. 362.12 K

C. 262.12 K

D. 562.12 K

Answer: A

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358. The ionisation energy of solid NaCl is 180 kcal, per mol. The dissolution of the solid in water in the form of ions is endothermic to the extent of 1 kcal per mol, If the solvation energies of Na^+ and Cl^- ions are in the ratio 6:5, what is the enthalpy of hydration of sodium ion:

A. $-85.6 \text{ kcal} \frac{\text{l}}{\text{m}} \text{ol}$

B. $-97.5 \text{ kcal} \frac{\text{l}}{\text{m}} \text{ol}$

C. $82.6 \text{ kcal} \frac{\text{l}}{\text{m}} \text{ol}$

D. $+100 \text{ kcal} \frac{\text{l}}{\text{m}} \text{ol}$

Answer: B

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359. If the enthalpy change for the reaction $CH_4(g) + Cl_2(g) \rightarrow CH_3Cl(g) + HCl(g)$, $\Delta H = -25 \text{ kcal}$. Bond

energy of C-H is 20kcal/mol greater than the bond energy of C-Cl and bond energies of H-H and H-Cl are same in magnitude, then for the reaction: $1/2H_2(g) + 1/2Cl_2(g) \rightarrow HCl(g)$ ΔH is

A. $-22.5kcal \frac{l}{m}ol$

B. $-20.5kcal \frac{l}{m}ol$

C. $-32.5kcal \frac{l}{m}ol$

D. $-12.5kcal \frac{l}{m}ol$

Answer: A

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360. The standard heat of formation of sodium ions in aqueous solution from the following data: Heat of formation of NaOH(aq) from NaOH(s) at $25^\circ C = -470kJ$

Heat of formation of OH(aq) from OH(s) at $25^\circ C = -228.8kJ$.

A. -251.9

B. 241.9 kJ

C. -241.9 kJ

D. 151.9 kJ

Answer: C

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361. For a diatomic molecule AB, the electronegativity difference between A and B is $0.2028\sqrt{\Delta}$ where $\Delta = [\text{Bond energy of AB} - \text{Geometric mean of the bond energies of } A_2 \text{ and } B_2]$. The electronegativities of fluorine and chlorine are 4.0 and 3.0 respectively and the bond energies are of F-F : 38 kcal mol^{-1} and Cl-Cl : 58 kcal mol^{-1} . The bond energy of Cl-F is:

A. 71 kcal/mol

B. 61 kcal/mol

C. 48 kcal/mol

D. 75 kcal/mol

Answer: A



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362. If heat of neutralisation is -13.7 k cal and $H_f^\circ H_2O = -68$ k cal, then enthalpy of OH^- would be:

A. 54.3 k cal

B. -54.3 kcal

C. 71.3 k cal

D. None

Answer: B

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363. The dissociation energy of CH_4 and C_2H_6 are respectively 360 and 620 kcal/mole. The bond energy of C-C bond is:

- A. 260 kcal/mol
- B. 180 kcal/mol
- C. 130 kcal/mol
- D. 80 kcal/mol

Answer: D

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364. 2.1 g of Fe combines with S evolving 3.77 kJ of heat. The heat of formation of FeS in kJ/mol is:

A. -3.77

B. -1.79

C. -100.5

D.

Answer: C

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365. The heat of neutralisation of HCl by NaOH is -55.9 kJ/mol. If the heat of neutralisation of HCN by NaOH is -12.1 kJ/mol. The energy of disso-ciation of HCN is:

A. -43.8 kJ

B. 43.8 kJ

C. 68 kJ

D. -68 kJ

Answer: B

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366. When a certain amount of ethylene was burnt 6226 kJ heat was evolved. If heat of combustion of ethylene is 1411 kJ, the volume of O_2 (at NTP) that entered into the reaction is:

- A. 296.5 mL
- B. 296.5 litre
- C. 622x22.4 litre
- D. 22.4 litre

Answer: B

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367. The heat evolved during the combustion of 112 litre of water gas (mixture of equal volume of H_2 and CO) is : Given $H_2(g) + \frac{1}{2}O_2(g) = H_2O(g); \Delta H = -241.8 \text{ kJ}$ $CO(g) + \frac{1}{2}O_2(g) = CO_2(g); \Delta H = -283 \text{ kJ}$

- A. 241.8 kJ
- B. 283 kJ
- C. 1312 kJ
- D. 1586 kJ

Answer: C

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368. Heat of combustion of CH_4 , C_2H_4 , C_2H_6 are -890, -1411 and -1560 kJ/mol respectively. Which has the lowest calorific fuel value in kJ/g:

A. CH_4

B. C_2H_4

C. C_2H_6

D. All same

Answer: B

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369. ΔH for $CaCO_3(s) \rightarrow CaO(s) + CO_2(g)$ is 176 kJ mol^{-1} at 1240 K. The ΔU for the change is equal to:

A. 160 kJ

B. 165.6 kJ

C. 186.3 kJ

D. 180.0 kJ

Answer: B

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370. Energy required to dissociate 4 gms of gaseous hydrogen into free gaseous atoms is 208 kcals at $25^{\circ}C$. The bond energy of H-H bond will be

- A. 104 kcal
- B. 10.4 kcal
- C. 1040 kcal
- D. 104 kcal

Answer: A

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371. Energy change during neutralisation of NH_4OH and HCl is :

A. $-1.5kJ$

B. $+1.5kJ$

C. $+3.0kJ$

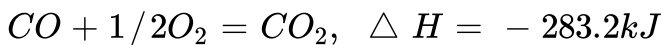
D. $-3.0kJ$

Answer: B

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372. From the thermochemical reactions, $C_{graphite} + 1/2O_2 = CO$,

$$\Delta H = -110.5kJ$$



ΔH for the reaction, $C_{graphite} + O_2 = CO_2$ is:

A. $-393.7kJ$

B. + 393.7kJ

C. - 172.7kJ

D. + 172.7kJ

Answer: A

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373. Energy change during neutralisation of NH_4OH and HCl is :

A. 13.7 kcal/eq.

B. less than 13.7 kcal/eq.

C. greater than 13.7 kcal/eq.

D. Zero

Answer: B

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374. ΔH for thermal decomposition process is:

- A. Positive
- B. Negative
- C. Zero
- D. Positive or negative

Answer: A

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375. Hess's law of constant heat summation is an application of:

- A. Kirchhoff's law
- B. First law of thermodynamic
- C. Second law of thermodynamics

D. Third law of thermodynamics

Answer: B

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376. Bond energy of a molecule:

A. Is always negative

B. Is always positive

C. Either positive or negative

D. Depends upon the physical state of the system

Answer: B

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377. For the reaction, $3O_2 \rightarrow 2O_3$, $\Delta H = +ve$. We can say that:

- A. Ozone is more stable than oxygen
- B. Ozone is less stable than oxygen and ozone decomposes forming oxygen readily
- C. Oxygen is less stable than ozone and oxygen readily forms ozone.
- D. None

Answer: B

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378. Which of the following is incorrect about the reaction,

- A. Heat of combustion of $C_D = -94.3kcal$.

B. Heat of formation of $CO_2 = -94.3kcal$

C. $\Delta H = \Delta U$

D. Standard heat of formation of CO_2

Answer: D



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379. The exchange of heat energy during chemical reaction at constant temperature and pressure occurs in from of:

A. Free energy

B. Internal energy

C. Enthalpy

D. Bond energy

Answer: C

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380. Molar heat capacity of water in equilibrium with the ice at constant pressure is:

A. Zero

B. ∞

C. $40.45 \text{ kJ K}^{-1} \text{ mol}^{-1}$

D. $75.48 \text{ J K}^{-1} \text{ mol}^{-1}$

Answer: B

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381. Heat energy change during the chemical reaction, $\text{CO} + 1/2\text{O}_2 \rightarrow \text{CO}_2$ is known as:

A. Heat of combustion of CO

B. Latent heat of CO_2

C. Latent heat of vaporisation

D. Heat of formation of CO_2

Answer: A

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382. When an exothermic is reversed, it:

A. Becomes another exothermic reaction

B. Becomes an endothermic reaction

C. Shows no change at all

D. Attains equilibrium

Answer: B



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383. Heat of formation of $H_2O(g)$ at 1 atm and $25^\circ C$ is -243 kJ . ΔE for the reaction, $H_2(g) + \frac{1}{2}O(g) \rightarrow H_2O(g)$ at $25^\circ C$ is

A. 241.8 kJ

B. -241.8 kJ

C. -243 kJ

D. 243 kJ

Answer: B



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384. The H-H bond energy is 430 kJ mol^{-1} and Cl-Cl bond energy is 240 kJ mol^{-1} . ΔH for HCl is -90 kJ . The H-Cl bond energy is about:

A. 425 kJ mol^{-1}

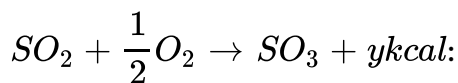
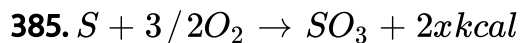
B. 213 kJ mol^{-1}

C. 360 kJ mol^{-1}

D. 180 kJ mol^{-1}

Answer: A

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The heat of formation of SO_2 is :

A. $y-2x$

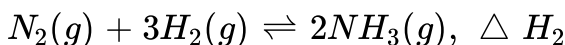
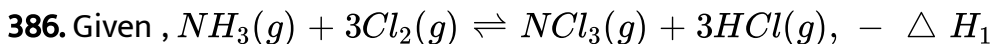
B. $(2x+y)$

C. $(x+y)$

D. $2x-y$

Answer: A

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$NCl_3(g)$ in the terms of ΔH_1 , ΔH_2 and ΔH_3 is:

A. $\Delta H_f = -\Delta H_1 + \frac{\Delta_2}{2} - \frac{3}{2}\Delta H_3$

B. $\Delta H_f = \Delta h_1 + \Delta \frac{H_2}{2} - \frac{3}{2}\Delta H_3$

C. $\Delta H_f = \Delta h_1 + \Delta \frac{H_2}{2} - \frac{3}{2}\Delta H_3$

D. None

Answer: A

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387. AB , A_2 and B_2 are diatomic molecules. If the bond enthalpies A_2AB and B_2 are in the ratio 1:1:0.5 and the enthalpy of formation of AB from A_2 and B_2 is -100 kJ mol^{-1} , what is the bond enthalpy of A_2 :

A. 200 kJ mol^{-1}

B. 200 kJ mol^{-1}

C. 100 kJ mol^{-1}

D. 300 kJ mol^{-1}

Answer: A

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388. $H_2(g) + Cl_2(g) \rightarrow 2HCl(g)$, $\Delta H_{298K} = -22.06 \text{ kcal}$, For this reaction, ΔU is equal to:

A. $-22.06 + 2 \times 10^{-3} \times 298 \times 2kcal$

B. $-22.06 - 2 \times 298kcal$

C. $-22.06 - 2 \times 298 \times 4kcal$

D. $-22.06kcal$

Answer: D

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389. For the reaction, $H_2(g) + \frac{1}{2}O_2(g) \rightarrow H_2O(l)$,

A. $7.63 \times (373 - 297) - 68.3$

B. $7.63 \times 10^{-3} \times (373 - 298) - 68.3$

C. $7.63 \times 10^{-3} \times (373 - 298) + 68.3$

D. $7.63 \times (373 - 297) + 68.3$

Answer: B



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390. According to the equation,
$$C_6H_6(l) + \frac{15}{2}O_2(g) \rightarrow 3H_2O(l) + 6C_2(g) \quad \Delta H = -3264.4 \text{ kJ/mol},$$

the energy evolved when 7.8 g of benzene is burnt in air will be:

- A. 163.22 kJ/mol
- B. 326.4 kJ/mol
- C. 32.64 kJ/mol
- D. 3.264 kJ/mol

Answer: B



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391. Given that standard heat enthalpy of CH_4 , C_2H_4 and C_3H_8 are -17.9, 12.5, -24.8 kcal/mol. The ΔH for $CH_4 + C_2H_4 \rightarrow C_3H_8$ is:

A. $-55.2kcal$

B. $-30.2kcal$

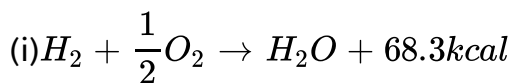
C. $55.2 kcal$

D. $-19.4kcal$

Answer: D

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392. Given, $C + O_2 \rightarrow CO_2 + 94.2kcal$.



(ii) $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O + 210.8kcal$ The heat of formation of methane in kcal will be:

A. 45.9

B. 47.8

C. 20.0

D. 47.3

Answer: C

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393. When 1mole of carbon is converted into 1mole of CO_2 the heat liberated is same:

- A. Irrespective of whether the volume is kept constant or pressure is kept constant
- B. Irrespective of the temperature at which the reaction is carried out
- C. Whether the carbon is in the form of diamond or garphite
- D. None

Answer: A

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394. Calorific value of carbohydrates is approximately:

- A. 4.0 kcal/g
- B. 16.0 kcal/g
- C. 20 kcal/g
- D. 9.0 kcal/g

Answer: B

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395. If $H^+ + OH \rightarrow H_2O + 13.7 \text{ kcal}$ then the heat of neutralisation for complete neutralisation of one mole of H_2SO_4 by a base will be:

A. 13.7kcal

B. 27.4kcal

C. 6.85kcal

D. 3.425 kcal

Answer: B

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396. If $H_2(g) = 2H(g)$, $\Delta H=104\text{ cal}$, then heat of atomisation of hydrogen is:

A. 52 kcal

B. 104 kcal

C. 208 kcal

D. None of these

Answer: A

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397. Given $N_2(g) + 3H_2(g) = 2NH_3(g)$, $\Delta H^\circ = -22\text{kcal}$. The standard enthalpy of formation of NH_3 gas is:

A. $-11\text{kcal}\frac{\text{l}}{\text{m}}\text{ol}$

B. $11\text{kcal}\frac{\text{l}}{\text{m}}\text{ol}$

C. $-22\text{kcal}\frac{\text{l}}{\text{m}}\text{ol}$

D. $22\text{kcal}\frac{\text{l}}{\text{m}}\text{ol}$

Answer: A

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398. ΔH for the reaction, $H(g) + H(g) \rightarrow H_2(g)$ will be,

A. Zero

B. +ve

C. -ve

D. infinite

Answer: C

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399. Which one of the following bonds has the highest average bond energy(kcal/mol):

A. S=O

B. C=C

C. C≡C

D. N≡N

Answer: D

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400. The Kirchhoff's equation given the effect of ____ on heat of reactions:

- A. Pressure
- B. Temperature
- C. Volume
- D. Molecularity

Answer: B

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401. Hess's law is used in the determination of:

- A. Heat of recation
- B. Heat of transition
- C. Heat of formation
- D. All of these

Answer: D

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402. When ammonium chloride is dissolved in water, the solution becomes cold. The change is:

- A. Endothermic
- B. Exothermic
- C. Super cooling
- D. None

Answer: A



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403. A Carnot engine operates between temperature T and 400 K ($T > 400$ K). If efficiency of engine is 25% , the temperature T is:

- A. 400 K
- B. 500 K
- C. 533.3 K
- D. 600 K

Answer: C



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404. The work done in an open vessel at 300K, when 112 g iron reacts with dil HCl is:

- A. -1.2 kcal
- B. 0.6 kcal
- C. -0.3 kcal
- D. 0.2 kcal

Answer: A



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405. 16kg oxygen gas expands at STP to occupy double of its original volume. The work done during the process is:

- A. 260 kcal
- B. 187.6 kcal

C. 130 kcal

D. 272.8 kcal

Answer: D

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406. Boiling point of a liquid is 50 K at 1 atm and $\Delta H_{vap} = 460.6$ cal mol⁻¹ What will be its boiling point at 10 atm.

A. 150 K

B. 75 K

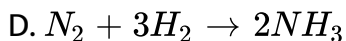
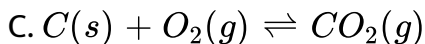
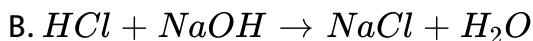
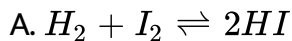
C. 100 K

D. 200 K

Answer: C

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407. For which change $\Delta H \neq \Delta U$:

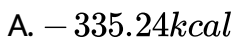


Answer: D



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408. The heat of combustion of ethanol determined by a bomb calorimeter is $-670.48 \text{ kcal mol}^{-1}$ at 25°C . What is ΔU at 25°C for the reaction, $C_2H_5OH(l) + 3O_2(g) \rightarrow 2CO_2 + 3H_2O(g)$ is:



B. -669.28kcal

C. -670.48kcal

D. $+670.48\text{kcal}$

Answer: C

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409. A person requires 2870 kcal of energy to lead normal daily life. If heat of combustion of cane sugar is - 1349 kcal, then his daily consumption of sugar is:

A. 728 g

B. 0.728 g

C. 342 g

D. 0.342 g

Answer: A

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410. The difference in ΔH and ΔE for the combustion of methane forming water in liquid state at $25^\circ C$ would be:

A. Zero

B. $2 \times 298 \times (-2) cal$

C. $2 \times 298 \times (-3) cal$

D. $2 \times 25 \times (-3) cal$

Answer: A

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411. The heat change taking place during the reaction $H_2O(l) \rightarrow H_2O(g)$ is ?[Given $\Delta H_1 = H_2O(g) = -57\text{kcal}$, $\Delta H_f = H_2O(l) = -68.3\text{kcal}$]:

A. $+11.3\text{kcal}$

B. -11.3kcal

C. -115.3kcal

D. $+115.3\text{kcal}$

Answer: A

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412. If, $C(s) + O_2(g) \rightarrow CO_2(g)$, $\Delta H = R$ and $CO(g) + \frac{1}{2}O_2(g) \rightarrow CO_2(g)$, $\Delta H = S$, then the heat of formation of CO is:

A. R+S

B. R-S

C. S-R

D. RXS

Answer: B

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413. The enthalpies of formation of N_2O and NO are 28 and $90kJmol^{-1}$ respectively. The enthalpy of the reaction, $2N_2O(g) + O_2(g) \rightarrow 4NO(g)$ is equal to:

A. 8 kj

B. 88 kj

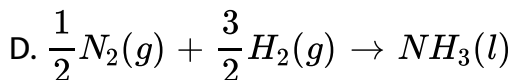
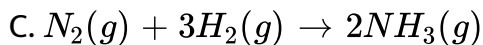
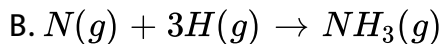
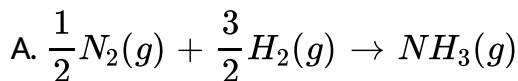
C. $-16kJ$

D. 304 kj

Answer: D

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414. The enthalpy of formation of ammonia gas at 298 K is -46.11kJ mol^{-1} . The equation to which this value related is:



Answer: A

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415. The heat of formation of methane $C(s) + 2H_2(g) \rightarrow CH_4(g)$ at constant is 18500 cal at $25^\circ C$. The heat of reaction at constant volume would be:

- A. 19096 cal
- B. 18798 cal
- C. 18202 cal
- D. 17904 cal

Answer: A

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416. $H_2 + \frac{1}{2}O_2 \rightarrow H_2O$, $\Delta H = -68.39$ kcal (i)

$K + aq \rightarrow KOH(aq) + \frac{1}{2}H_2$, $\Delta H = -48$ kcal

(ii) $KOH + aq \rightarrow KOH(aq)$; $\Delta H = -14$ kcal (iii) The heat of formation (in kcal) of KOH is:

A. $-68.39 + 48 - 14$

B. $-68.39 - 48 - 14$

C. $68.39 - 48 + 14$

D. $68.39+48+14$

Answer: B

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417. The enthalpy of formation of ammonia is -46.0kJ mol^{-1} . The enthalpy change for the reaction, $2\text{NH}_3(\text{g}) \rightarrow \text{N}_2(\text{g}) + 3\text{H}_2(\text{g})$ is:

A. 46.0kJmol^{-1}

B. 92.0kJmol^{-1}

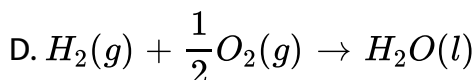
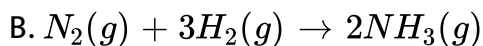
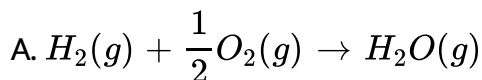
C. -23.0kJmol^{-1}

D. -92.0kJmol^{-1}

Answer: B

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418. A positive change in enthalpy occurs in:



Answer: C

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419. The amount of heat evolved when one mole of H_2SO_4 reacts with two mole of NaOH is:

A. 57.3 KJ

B. 2x57.3 KJ

C. 57.3/2 KJ

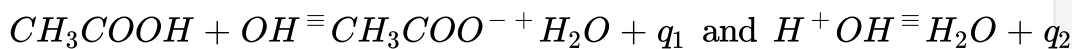
D. None

Answer: C

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420.

If



then the enthalpy change for the reaction,



A. $q_1 + q_2$

B. $q_1 - q_2$

C. $q_2 - q_1$

D. $-q_1 - q_2$

Answer: B

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421. The heats of neutralisation of four acids A, B, C, D are -13.7, -9.4, -11.2 and -12.4 kcal respectively when they are neutralised by a common base. The acidic character obeys the order:

A. AgtBgtCgtD

B. AgtDgtCgtB

C. DgtCgtBgtA

D. DgtBgtCgtA

Answer: B

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422. In a chemical reaction if all reactants and products are in liquid state then:

A. $\Delta H > \Delta U$

B. $\Delta H < \Delta U$

C. $\Delta H = \Delta U$

D. None

Answer: C



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423. Standard molar enthalpy of formation of CO_2 is equal to:

A. Zero

B. The standard molar enthalpy of combustion of gaseous carbon

C. The sum of standard molar enthalpies formation of CO and O_2

D. The standard molar enthalpy of combustion of carbon (graphite)

Answer: D

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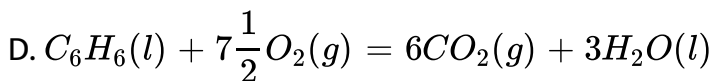
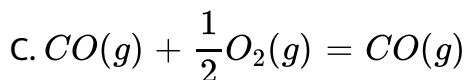
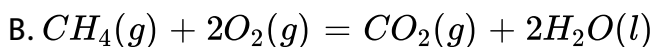
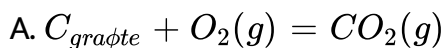
424. Which is correct about the heat of combustion:

- A. The combustion be exothermic in some cases and endothermic in other cases.
- B. Heat of combustion is always exothermic
- C. Its value change with temperature
- D. All

Answer: D

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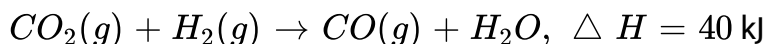
425. If $C(s) + O_2(g) \rightarrow CO_2(g)$, $\Delta H = X$ and $CO(g) + \frac{1}{2}O_2(g) \rightarrow CO_2(g)$, $\Delta H = Y$ then the heat of formation of CO is



Answer: A

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426. ΔH for the reaction given below represents:



- A. Enthalpy of formation
- B. Enthalpy of combustion
- C. Enthalpy of neutralisation
- D. Enthalpy of reaction

Answer: D

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427. Molar heat capacity of a gas at constant temperature and pressure is:

- A. $(3/2) R$
- B. $(5/2) R$
- C. ∞
- D. Depends upon atomicity of gas

Answer: C

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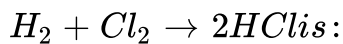
428. If 50 calorie are added to a system and system does work of 30 calorie on surroundings, the change in internal energy of system is:

- A. 20 cal
- B. 50 cal
- C. 40 cal
- D. 30 cal

Answer: A

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429. If S° for H_2 , Cl_2 and HCl are 0.13, 0.22 and 0.19 $\text{kJ } K^{-1} \text{mol}^{-1}$ respectively. The total change in standard entropy for the reaction,



A. $30 \text{ J } K^{-1} \text{mol}^{-1}$

B. $40 \text{ J } K^{-1} \text{mol}^{-1}$

C. $60 \text{ J } K^{-1} \text{mol}^{-1}$

D. $20 \text{ J } K^{-1} \text{mol}^{-1}$

Answer: A

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430. The enthalpy and entropy change for a chemical reaction are -2.5×10^3 cal and $7.4 \text{ cal } K^{-1}$ respectively. Predict that nature of reaction at 298 K is:

- A. Spontaneous
- B. Reversible
- C. Irreversible
- D. None-spontaneous

Answer: A

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431. One mole of an ideal at 300 K is expanded isothermally from an initial volume of 1 liter to 10 liters. The ΔE for this process is [$R = 2 \text{ cal } k^{-1} \text{ mol}^{-1}$]

- A. 163.7 cal
- B. 1381.1 cal
- C. 9 litre-atm
- D. Zero

Answer: D

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432. Latent heat of vaporisation of a liquid at 500K and 1 atm pressure is 10.0 kcal/mol. What will be the change in internal energy (ΔE) of 3 mole of liquid at same temperature:

- A. 13.0 kcal
- B. -13.0kcal
- C. 27.0 kcal
- D. -27.0kcal

Answer: C

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433. Give the bond energies of N equiv N, H-H and N-H bonds as 945, 436 and 391 kJmol^{-1} respectively, the enthalpy of the following reaction $\text{N}_2(\text{g}) + 3\text{H}_2(\text{g}) \rightarrow 2\text{NH}_3(\text{g})$ is:

A. -93kJ

B. 102 kJ

C. 90 kJ

D. 105 kJ

Answer: A

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434. If heat of formation of CCl_4 is 316 kcal mol^{-1} the dissociation energy of C-Cl is :

A. 79kcalmol^{-1}

B. 316kcalmol^{-1}

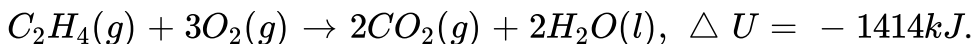
C. 97kcalmol^{-1}

D. 158kcalmol^{-1}

Answer: A

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435. For the reaction,



Then ΔH at 27°C is:

A. -1410kJ

B. -1420kJ

C. $+1420\text{kJ}$

D. $+1410\text{kJ}$

Answer: B

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436. $H_2(g) + I_2(g) \rightarrow 2HI(g)$, $\Delta H = -12.40\text{kcal}$, Heat of formation of HI will be

- A. 12.4 kcal
- B. -12.4kcal
- C. -6.20kcal
- D. 6.20 kcal

Answer: D

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437. Heat evolved in the reaction, $H_2 + Cl_2 \rightarrow 2HCl$ is 182 kJ. Bond energies of H-H and Cl-Cl are 430 and 242 kJ/mol respectively. The H-Cl bond energy is:

A. 245 kJ mol^{-1}

B. 427 kJ mol^{-1}

C. 336 kJ mol^{-1}

D. 154 kJ mol^{-1}

Answer: A

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438. The heat of formation of $CO(g)$ and $CO_2(g)$ are $\Delta H = -110$ and $\Delta H = -393 \text{ kJ mol}^{-1}$ respectively. What is the heat of reaction (ΔH) (in kJ mol^{-1}) for the following reaction? $CO(g) + \frac{1}{2} O_2(g) \rightarrow CO_2(g)$

A. -50

B. -283

C. -150

D. -300

Answer: D

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439. If, $S + O_2 \rightarrow SO_2$, $\Delta H = -298.2kJ$

(i) $SO_2 + \frac{1}{2}O_2 \rightarrow SO_3$, $\Delta H = -98.7kJ$

(ii) $SO_3 + H_2O \rightarrow H_2SO_4$, $\Delta H = -130.2kJ$

(iii) $H_2 + \frac{1}{2}O_2 \rightarrow H_2O$, $\Delta H = -287.3kJ$ The enthalpy of

formation of H_2SO_4 at 298 K will be:

A. $-754.4kJ$

B. $-814.4kJ$

C. -650.3kJ

D. -433.7kJ

Answer: A

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440. $H_2(g) + Cl_2(g) = 2HCl(g)$, $\Delta H = -44.12 \text{ kcal}$ The enthalpy of hydrogen chloride at 298 K is:

A. -44.12

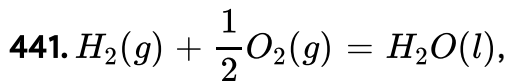
B. -22.06

C. 44.12

D. 22.06

Answer: B

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$\Delta H_{298K} = -68.32$ kcal. Heat of vaporisation of water at 1 atm and $25^\circ C$ is 10.52 kcal. The standard heat of formation (in kcal) of 1 mole of water vapour at $25^\circ C$ is:

A. -78.84

B. 78.84

C. $+57.80$

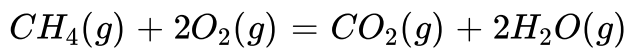
D. -57.80

Answer: D

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442. Standard heat of formation of $CH_4(g)$, $CO_2(g)$ and water at $25^\circ C$ are -17.9 , -94.1 K and -68.3 kcal mol^{-1} respectively. Calculate the

heat change (in kcal) in the following reaction at $25^{\circ}C$:



A. -144.5

B. -180.3

C. -248.6

D. -212.8

Answer: D

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443. Molar heat capacity is given by:

A. dQ/dT

B. $dq \times dT$

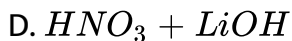
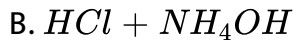
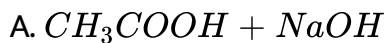
C. $\sum Q_1/dT$

D. None

Answer: A

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444. Heat of neutralisation of a strong acid and strong base is always.



Answer: D

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445. Endothermic compounds are generally:

- A. Less stable
- B. Have weaker bonds
- C. Have positive enthalpies of formation
- D. All are correct

Answer: D

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446. The heat evolved during neutralisation is maximum in the reaction of:

- A. NH_4OH and CH_3COOH
- B. NH_4OH and HCl
- C. $NaOH$ and CH_3COOH

D. $NaOH$ and HCl

Answer: D

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447. For the reaction, $CaCO_3(s) \rightarrow CaO(s) + CO_2(g)$

A. $\Delta H = \Delta U$

B. $\Delta H < \Delta U$

C. $\Delta H \neq \Delta U$

D. $\Delta H = 0$

Answer: C

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448. ΔH for transition of carbon in the diamond form to carbon in the graphite form, is -453.5 cal. This suggests that:

- A. Graphite is chemically different from diamond.
- B. Graphite is as stable as diamond
- C. Graphite is more stable than diamond
- D. Diamond is more stable than graphite.

Answer: C



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449. Which represents the largest amount of energy :

- A. calorie
- B. joule
- C. erg

D. electron volt

Answer: A

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450. In the combustion of hydrocarbons, ΔH is:

A. Negative

B. Zero

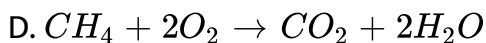
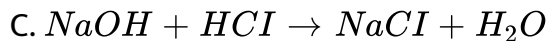
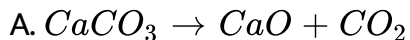
C. Positive

D. Undeterminate

Answer: A

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451. For an endothermic reaction



Answer: A

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452. The enthalpies of formation of organic substances can be conveniently determined from:

A. Heats of combustion data

B. Boiling point

C. Melting point

D. A catalytic reaction

Answer: A

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453. Entropy of vaporisation of water at 100°C , if molar heat of vaporisation is 9710 cal mol^{-1} will be:

A. $20\text{ cal mol}^{-1}\text{K}^{-1}$

B. $26.0\text{ cal mol}^{-1}\text{K}^{-1}$

C. $24\text{ cal mol}^{-1}\text{K}^{-1}$

D. $28.0\text{ cal mol}^{-1}\text{K}^{-1}$

Answer: B

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454. One mole of ice is converted into water at 273 K. The entropies of $H_2O(s)$ and $H_2O(l)$ are 38.20 and 60.01 $J mol^{-1}K^{-1}$ respectively. The enthalpy change for the conversion is:

A. $59.54 J mol^{-1}$

B. $5954 J mol^{-1}$

C. $595.4 J mol^{-1}$

D. $320.6 J mol^{-1}$

Answer: B

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455. One mole of a gas absorbs 200 J of heat at constant volume. Its temperature rises from 298 K to 308 K. The change in internal energy is:

A. 200 J

B. $-200J$

C. $200 \times 308/297 J$

D. $200 \times 298/308 J$

Answer: A

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456. A system absorbs 10 kJ of heat at constant volume and its temperature rises from $27^\circ C$ to $37^\circ C$. The ΔU of reaction is:

A. 100 kJ

B. 10 kJ

C. Zero

D. 1 kJ

Answer: B

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457. One mole of a gas occupying 3 dm^3 expands against constant external pressure of 1 atm to a volume of 13 dm^3 . The work done is:

A. -10 atm dm^3

B. -20 atm dm^3

C. -39 atm dm^3

D. -48 atm dm^3

Answer: A

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