*** Chemistry** **[480]**

1. Match List-I with List-II.

List $-I$ (Process)	List $-II$ (Conditions)
A. Isothermal process	I. No heat exchange
B. Isochoric process	II. Carried out at constant temperature
C. Isobaric process	III. Carried out at constant volume
D. Adiabatic process	IV. Carried out at constant pressure

Choose the correct answer from the options given below:

(A) $A-IV, B-II, C-III, D-I$ (B) $A-I, B-II, C-III, D-IV$

(C) $A-II, B-III, C-IV, D-I$ (D) $A-IV, B-III, C-II, D-I$

2. The work done during reversible isothermal expansion of one mole of hydrogen gas at $25^{\circ}\mathrm{C}$ from pressure of $20\mathrm{atmosphereto}10\mathrm{atmosphere}$ is

(Given $R=2.0\mathrm{calK}^{-1}\ \mathrm{mol}^{-1}$)

(A) -413.14 calories (B) 413.14 calories (C) 100 calories (D) 0 calorie

3. Which amongst the following options is the correct relation between change in enthalpy and change in internal energy?

(A) $\Delta H+\Delta U=\Delta nR$ (B) $\Delta H=\Delta U-\Delta n_9RT$

(C) $\Delta H=\Delta U+\Delta n_gRT$ (D) $\Delta H-\Delta U=-\Delta nRT$

4. Given below are two statements: one is labelled as Assertion A and the other is labelled as Reason R

Assertion A : In equation $\Delta_rG=-nFE_{\text{cell}}$ value of Δ_rG depends on n.

Reasons R : E_{cell} is an intensive property and Δ_rG is an extensive property.

In the light of the above statements, choose the correct answer from the options given below

(A) A is false but R is true

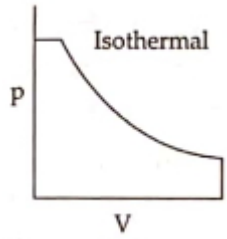
(B) Both A and R are true and R is the correct explanation of A

(C) Both A and R are true and R is NOT the correct explanation of A

(D) A is true but R is false

5. Which of the following $p-V$ curve represents maximum work done?

(A)



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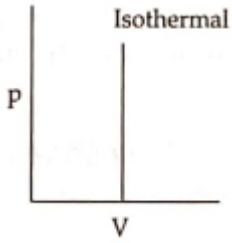

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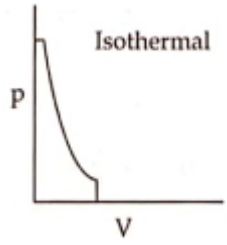
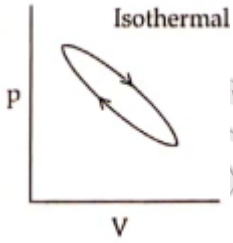


(D)



6. Which one among the following is the correct option for right relationship between C_P and C_V for one mole of ideal gas?

(A) $C_P + C_V = R$ (B) $C_P - C_V = R$ (C) $C_P = RC_V$ (D) $C_V = RC_P$

7. If for a certain reaction $\Delta_r H$ is $30\ kJ\ mol^{-1}$ at $450\ K$, the value of $\Delta_r S($ in $JK^{-1}mol^{-1})$ for which the same reaction will be spontaneous at the same temperature is

(A) -70 (B) 70 (C) -33 (D) 33

8. In which case change in entropy is negative ?

(A) Evaporation of water

(B) Expansion of a gas at constant temperature

(C) Sublimation of solid to gas

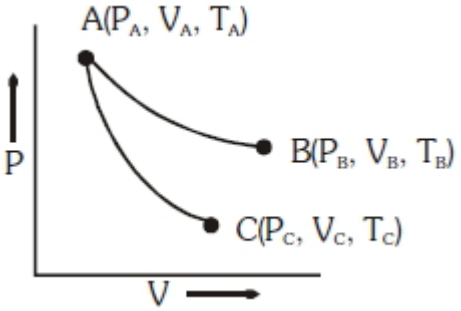
(D) $2H(g) \rightarrow H_2(g)$

9. Reversible expansion of an ideal gas under isothermal and adiabatic conditions are as shown in the figure

$AB \rightarrow$ Isothermal expansion

$AC \rightarrow$ Adiabatic expansion

Which of the following options is not correct ?



(A) $\Delta S_{\text{isothermal}} > \Delta S_{\text{adiabatic}}$ (B) $T_A = T_B$

(C) $W_{isothermal} > \mathrm{W_{adiabatic}}$ (D) $\mathrm{T_C > T_A}$

10. The bond dissociation energies of $\mathrm{X_2, Y_2}$ and XY are in the ratio of $1 : 0.5 : 1$. $\Delta \mathrm{H}$ for the formation of XY is $-200\ \mathrm{kJmol^{-1}}$. The bond dissociation energy of X_2 will be.....$\mathrm{kJmol^{-1}}$

(A) 200 (B) 100 (C) 800 (D) 400

11. The correct thermodynamic conditions for the spontaneous reaction at all temperatures is

(A) $\Delta H > 0$ and $\Delta S < 0$ (B) $\Delta H < 0$ and $\Delta S < 0$

(C) $\Delta H < 0$ and $\Delta S = 0$ (D) $\Delta H < 0$ and $\Delta S > 0$

12. The heat of combustion of carbon to CO_2 is $-393.5\ kJ/mol$. The heat released upon formation of $35.2\ g$ of CO_2 from carbon and oxygen gas is

(A) $+315\ kJ$ (B) $-630\ kJ$

(C) $-3.15\ kJ$ (D) None of the above

13. Ratio of C_p and C_v of a gas X is 1.4, the number of atom of the gas 'X' present in 11.2 litres of it at NTP will be

(A) 6.02×10^{23} (B) 1.2×10^{23} (C) 3.01×10^{23} (D) 2.01×10^{23}

14. Equal volumes of monoatomic and diatomic gases at same initial temperature and pressure are mixed. The ratio of specific heats of the mixture (C_p/C_v) will be

(A) 1 (B) 2 (C) 1.67 (D) 1.5

15. When $100\,ml$ of $1\,M\ NaOH$ solution and $10\,ml$ of $10\,N\ H_2SO_4$ solution are mixed together, the resulting solution will be

(A) Alkaline (B) Acidic (C) Strongly acidic (D) Neutral

16. If $C + O_2 \rightarrow CO_2 + 94.2\,kcal$ $H_2 + \frac{1}{2}O_2 \rightarrow H_2O + 68.3\,kcal$ $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O + 210.8\,kcal$ then the possible heat of methane will be.....$kcal$

(A) 47.3 (B) 20 (C) 45.9 (D) -47.3

17. The enthalpy of fusion of ice per mole.....kJ

(A) 18 (B) 8 (C) 80 (D) 6

18. The mutual heat of neutralisation of $40\,gm$ of $NaOH$ and $60\,gm$ CH_3COOH will be

(A) $56.1\,kcal$ (B) Less than $56.1\,kcal$

(C) More than $56.1\,kcal$ (D) $13.7\,kcal$

19. Heat of formation of $CO_2(g)$, $H_2O(l)$ and $CH_4(g)$ are $-94.0, -68.4$ and $-17.9\,kcal$ respectively. The heat of combustion of methane is.....$kcal$

(A) -212.9 (B) -136.8 (C) -304.3 (D) -105.2

20. A solution of $500\,ml$ of $0.2\,M\,KOH$ and $500\,ml$ of $0.2\,M\,HCl$ is mixed and stirred; the rise in temperature is T_1. The experiment is repeated using $250\,ml$ each of solution, the temperature raised is T_2. Which of the following is true

(A) $T_1 = T_2$ (B) $T_1 = 2T_2$ (C) $T_1 = 4T_2$ (D) $T_2 = 9T_1$

21. If $H^+ + OH^- \rightarrow H_2O + 13.7\,kcal$, then the heat of neutralization for complete neutralization of one mole of H_2SO_4 by base will be.....$kcal$

(A) 13.7 (B) 27.4 (C) 6.85 (D) 3.425

22. Heat of neutralisation for the given reaction $NaOH + HCl \rightarrow NaCl + H_2O$ is $57.1\,kJ\,mol^{-1}$. What will be the heat released when $0.25\,mole$ of $NaOH$ is titrated against $0.25\,mole$ of HCl .....$kJ\,mol^{-1}$

(A) 22.5 (B) 57.1 (C) 14.3 (D) 28.6

23. In the combustion of $2.0\,gm$ of methane $25\,kcal$ heat is liberated, heat of combustion of methane would be.....$kcal$

(A) 100 (B) 200 (C) 300 (D) 400

24. Enthalpy of formation of HF and HCl are $-161\,kJ$ and $-92\,kJ$ respectively. Which of the following statements is incorrect

(A) HCl is more stable than HF

(B) HF and HCl are exothermic compounds

(C) The affinity of fluorine to hydrogen is greater than the affinity of chlorine to hydrogen

(D) HF is more stable than HCl

25. The heat of reaction at constant pressure is given by

(A) $E_P - E_R$ (B) $E_R - E_P$ (C) $H_P - H_R$ (D) $H_R - H_P$

26. Equal volumes of methanoic acid and sodium hydroxide are mixed. If x is the heat of formation of water, then heat evolved on neutralisation is

(A) More than x (B) Equal to x (C) Twice of x (D) Less than x

27. Heat of neutralization of the acid-base reaction is $57.32\,kJ$ for

(A) $HNO_3 + LiOH$ (B) $HCOOH + KOH$

(C) $HCl + NH_4OH$ (D) $CH_3COOH + NaOH$

28. In order to decompose $9\,g$ water $142.5\,kJ$ heat is required. Hence the enthalpy of formation of water is.....kJ

(A) -142.5 (B) $+142.5$ (C) -285 (D) $+285$

29. Heat of neutralization of strong acid and weak base is

(A) $57.1\,kJ\,mol^{-1}$

(B) $13.7\,kJ\,mol^{-1}$

(C) Less than $13.7\,kcal\,mol^{-1}$

(D) More than $13.7\,kcal\,mol^{-1}$

30. When the aqueous solution of $0.5\,mole\ HNO_3$ is mixed with the $0.3\,mole$ of OH^- solution, then what will be the liberated heat.....kJ (Enthalpy of neutralization is $= 57.1\,kJ$)

(A) 28.5 (B) 17.1 (C) 45.7 (D) 1.7

31. What is the weight of oxygen that is required for the complete combustion of $2.8\,kg$ of ethylene? ....kg

(A) 9.6 (B) 96 (C) 6.4 (D) 2.8

32. The heat of combustion of carbon to CO_2 is $-393.5\,kJ/mol$. The heat released upon formation of $35.2\,g$ of CO_2 from carbon and oxygen gas is .....kJ

(A) $+315$ (B) -31.5 (C) -315 (D) $+31.5$

33. If the heat of formation of CO_2 is$-393\,kJ$. The amount of heat evolved in the formation of $0.156\,kg$ of CO_2 is.....kJ

(A) -1357.9 (B) -1275.9 (C) -1572 (D) -1165.5

34. The bond dissociation energies of gaseous H_2, Cl_2 and HCl are $104,58$ and $103\,kcal$ respectively. The enthalpy of formation of HCl gas would be.....$kcal$

(A) -44 (B) 44 (C) -22 (D) 22

35. The $H-H$ bond energy is $430\,kJ\ mol$ and $Cl-Cl$ bond energy is $240\,kJ\,mol^{-1}$. ΔH for HCl is $-90\,kJ$. The $H-Cl$ bond energy is about.....$kJ\,mol^{-1}$

(A) 180 (B) 360 (C) 213 (D) 425

36. If enthalpies of methane and ethane are respectively 320 and 360 calories then the bond energy of $C-C$ bond is.....$calories$

(A) 80 (B) 40 (C) 60 (D) 120

37. The value of heat generated when $36.5\,gm\ HCl$ and $40\,gm$ of $NaOH$ reacts during neutralization.....$kcal$

(A) 76.5 (B) 13.7 (C) More than 13.7 (D) 108

38. Enthalpy of solution of $NaOH$ (solid) in water is $-41.6\,kJ\,mol^{-1}$. When $NaOH$ is dissolved in water, the temperature of water

(A) Increase (B) Decreases

(C) Does not change (D) Fluctuates indefinitely

39. Consider the reactions $C(s)+2H_2(g)\rightarrow CH_4(g), \Delta H=-x\,kcal$

$C(g)+4H(g)\rightarrow CH_4(g),\ \Delta H=-x_1\,k\,cal$

$CH_4(g)\rightarrow CH_3(g)+H(g),\ \Delta H=+y\,k\,cal$

The bond energy of $C-H$ bond is

(A) $y\,kcal\,mol^{-1}$ (B) $x_1\,kcal\,mol^{-1}$ (C) $x/4\,kcal\,mol^{-1}$ (D) $x_1/4\,kcal\,mol^{-1}$

40. Given the bond energies $N \equiv N$, $H-H$ and $N-H$ bonds are $945, 436$ and $391\, kJ\, mole^{-1}$ respectively, the enthalpy of the following reaction $N_2(g)+3H_2(g) \rightarrow 2NH_3(g)$ is.....kJ

(A) -93 (B) 102 (C) 90 (D) 105

41. When $50\, cm^3$ of $0.2\, N\, H_2SO_4$ is mixed with $50\, cm^3$ of $1\, N\, KOH$, the heat liberated is

(A) $11.46\, kJ$ (B) $57.3\, kJ$ (C) $573\, kJ$ (D) $573\, J$

42. The heat of neutralization of HCl by $NaOH$ under certain condition is $-55.9\ kJ$ and that of HCN by $NaOH$ is $-12.1\ kJ$. the heat of ionization of HCN is ..... $\mathrm{kJ\,mol^{-1}}$

(A) -68 (B) -43.8 (C) 68 (D) 43.8

43. The heat of neutralization of a strong acid and a strong alkali is $57.0\, kJ\, mol^{-1}$. The heat released when 0.5 mole of HNO_3 solution is mixed with $0.2\, mole$ of KOH is....kJ

(A) 57 (B) 11.4 (C) 28.5 (D) 34.9

44. The enthalpy of dissolution of $BaCl_2\ (s)$ and $BaCl_2.2H_2O\ (s)$ are -20.6 & $8.8\ kJ\ mol^{-1}$ respectively. Calculate enthalpy of hydration for given reaction $BaCl_2\,(s)+2H_2O \rightarrow BaCl_2.2H_2O\,(s)$ .....kJ

(A) -29.4 (B) -35.4 (C) -24.4 (D) -15.2

45. Calculate the $N-N$ bond energy in N_2H_4 from given bond enthalpy data.
$\varepsilon_{N-H} = 393\, kJ/mole$
$\varepsilon_{H-H} = 436\, kJ/mole$
$\Delta H_{vap}[N_2H_4(l)] = 18\, kJ/mole$
$N_2H_4(l)+H_2(g) \rightarrow 2NH_3(g) : \Delta H = -142\, kJ/mole$
.....$kJ/mole$

(A) 210 (B) 190 (C) 180 (D) 150

46. The enthalpy change for the reaction, $H_2(g)+C_2H_4(g) \rightarrow C_2H_6(g)$ is .....$kcal\, mol^{-1}$ The bond energies are, $[e_{H-H}=103, e_{C-H}=99, e_{C-C}=80]$ and $[e_{C=C}=145\, kcal\, mol^{-1}]$

(A) -10 (B) $+10$ (C) -30 (D) $+30$

47. The enthalpy change for the reaction, $C_2H_6(g) \rightarrow 2C(g)+6H(g)$ is $X\, kJ$. The bond energy of $C-H$ bond is :-

(A) $\frac{X}{2}$ (B) $\frac{X}{3}$ (C) $\frac{X}{6}$ (D) Data insufficient

48. The enthalpy of neutralization of a strong acid by a strong base is $-57.32\ kJ/mol$ the enthalpy of formation of water is $-285.84\ kJ/mol$. The enthalpy of formation of hydroxyl ion is.....kJ/mol

(A) $+228.52$ (B) -114.26 (C) -228.52 (D) $+114.2$

49. The heat evolved in the combustion of methane is given by the following equation

$CH_4(g) + 2O_2(g) \rightarrow CO_2(g) + 2H_2O(l);$

$\Delta H = -890.3\,kJ$

How many grams of methane would be required to produce $445.15\,kJ$ of heat of combustion.....g

(A) 4 (B) 8 (C) 12 (D) 16

50. The molar enthalpies of combustion of $C_2H_2(g), C(graphite)$ and $H_2(g)$ are $-1300, -394,$ and $-286\,KJ\,mol^{-1}$, respectively. The standard enthalpy of formation of $C_2H_2(g)$ is .....$kJ\,mol^{-1}$

(A) -226 (B) -626 (C) 226 (D) 626

51. With the help of following data, find out the change in heat content for the reaction.....kJ

$C_2H_4(g) + H_2(g) \rightarrow C_2H_6(g)$

Bond	Bond energy (kJ)
$C-H$	413
$C-C$	348
$C=C$	610
$H-H$	436

(A) -128 (B) $+128$ (C) $+256$ (D) -256

52. The heat of combustion of ethylene $C_2H_4(g)$ is $-1420\,kJ/mole$. The number of litres of C_2H_4 at NTP that would evolve $355\,kJ$ on combustion is

(A) 2.8 (B) 8.4 (C) 5.6 (D) 11.2

53. The bond enthalpies of H_2, X_2 and HX are in the ratio of $2:1:2$. If the enthalpy for formation of HX is $-50\,kJ\,mol^{-1}$, the bond enthalpy of H_2 is .....$kJ\,mol^{-1}$

(A) 200 (B) 400 (C) 100 (D) 300

54. The heat of neutralization of a strong acid and a strong alkali is $-57.0\,kJ\,mol^{-1}$. The heat released when $0.5\,mole$ of HNO_3 solution is mixed with $0.2\,mole$ of KOH is ....kJ

(A) 57 (B) 11.4 (C) 28.5 (D) 34.9

55. The enthalpy of combustion of benzene from the following data will be

$(i)\,6C(s) + 3H_2(g) \rightarrow C_6H_6(l); \Delta H = +45.9\,kJ$

$(ii)\,H_2(g) + \frac{1}{2}O_2(g) \rightarrow H_2O(l); \Delta H = -285.9\,kJ$

$(iii)\,C(s) + O_2(g) \rightarrow CO_2(g); \Delta H = -393.5\,kJ$

.....kJ

(A) $+3172.8$ (B) -1549.2 (C) -3172.8 (D) -3264.6

56. Which of the following acid will release maximum amount of heat when completely neutralised by strong base $NaOH$?

(A) $1\,M\ HCl$ (B) $1\,M\ HNO_3$ (C) $1\,M\ HClO_4$ (D) $1\,M\ H_2SO_4$

57. The molar enthalpies of combustion of $C_2H_2(g), C$ (graphite) and $H_2\,(g)$ are $-1300, -394$ and $-286\,kJ\,mol^{-1}$, respectively. The standard enthalpy of formation of $C_2H_2\,(g)$ is.....$kJ\,mol^{-1}$

(A) -226 (B) -626 (C) 226 (D) 626

58. ΔH_f^o of water is $-285.5\,kJ\,mol^{-1}$. if enthalpy of neutralisation of monoacidic strong base is $-57.3\,kJ\,mol^{-1}$, of OH^- ion will be.....$kJ\,mol^{-1}$

(A) -228.2 (B) 228.5 (C) 114.5 (D) -114.5

59. If combustion of $4g$ of CH_4 liberates $2.5\,kcal$ of heat, the heat of combustion of CH_4 is .....$kcal$

(A) -20 (B) -10 (C) 2.5 (D) -5

60. Heat of neutralisation of $NaOH$ and HCl is $-57.46\,kJ/eq.$ Then heat of ionisation of water in kJ/mol is

(A) -57.46 (B) $+57.46$ (C) -114.92 (D) $+114.92$

61. What is the activation energy for the reverse of this reaction?

$N_2O_4(g) \rightarrow 2NO_2(g)$

Data for the given reaction is

$\Delta H = +54\,kJ$ and $E_a = +57.2\,kJ$

.....kJ

(A) -54 (B) $+3.2$ (C) $+60.2$ (D) $+111.2$

62. With the help of following data, find out the change in heat content for the reaction

$C_2H_4(g) + H_2(g) \rightarrow C_2H_6(g)$

.....kJ

Bond	Bond energy (kJ)
$C-H$	413
$C-C$	348
$C=C$	610
$H-H$	436

(A) -128 (B) $+128$ (C) $+256$ (D) -256

63. Based on Hess's law calculations, what is the average $S-O$ bond energy in SO_3 if ΔH_f^o of SO_3 is $-270\,kJ\,mol^{-1}$. Bond energy of $O=O$ is $130\,kJ\,mol^{-1}$ and heat of sublimation for $S(s)$ is $100\,kJ\,mol^{-1}$? ....$kJ\,mol^{-1}$

(A) 188.5 (B) 120 (C) 12 (D) 100

64. Given that the bond energy of hydrogen-hydrogen bonds is $436\,kJ/mol$, that of hydrogen-oxygen bonds is $464\,kJ/mol$, and those in oxygen molecules $496\,kJ/mol$, what is the approximate heat of reaction for $2H_2 + O_2 \longrightarrow 2H_2O$? ... kJ/mol

(A) -488 (B) -440 (C) 440 (D) 488

65. For the reaction $OF_{2(g)} \rightarrow O_{(g)} + 2F_{(g)}$, $\Delta_{rxn}H$ is $368\,kJ$. What is the average $O—F$ bond energy ? ....kJ

(A) 184 (B) 368 (C) 536 (D) 736

66. Enthalpy of neutralization of HCl by $NaOH$ is $-55.84\,kJ/mol$ and by NH_4OH is $-51.34\,kJ/mol$. The enthalpy of ionization of NH_4OH is .....kJ

(A) -107.18 (B) 107.18 (C) 4.5 (D) -4.5

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

(A) 8 (B) 88 (C) -16 (D) 304

68. If the enthalpy of formation and enthalpy of solution of $HCl\,(g)$ are $-92.3\,kJ/mol$ and $-75.14\,kJ/mol$ respectively then find enthalpy of formation of $Cl^-(aq)$ [Assume $\Delta H_{f(H^+)} = 0$] .....kJ/mol

(A) -17.16 (B) -167.44 (C) 17.16 (D) None of these

69. ΔH_f^o of water is $-285.5\,kJ\,mol^{-1}$. if enthalpy of neutralisation of monoacidic strong base is $-57.3\,kJ\,mol^{-1}$, ΔH_f^o of OH^- ion will be.....$kJ\,mol^{-1}$

(A) -228.2 (B) 228.5 (C) 114.5 (D) -114.5

70. $1\,mole$ of H_2SO_4 is mixed with $2\,moles$ of $NaOH$. The heat evolved will be

(A) $57.3\,kJ$ (B) $2 \times 57.3\,kJ$

(C) $57.3/2\,kJ$ (D) cannot be predicted

71. If the bond energies of $H—H$, $Br—Br$ and $H—Br$ are $433, 192$ and $364\,kJ\,mol^{-1}$ respectively, ΔH^o for the reaction $H_{2(g)} + Br_{2(g)} \rightarrow 2HBr_{(g)}$ is.....kJ

(A) -261 (B) $+103$ (C) $+261$ (D) -103

72. Calculate the enthalpy change for the reaction
$H_2 + F_2 \longrightarrow 2HF$
given that
Bond energy of $H-H$ bond $= 434\,kJ/mol$
Bond energy of $F-F$ bond $= 158\,kJ/mol$
Bond energy of $H-F$ bond $= 565\,kJ/mol$
.....kJ

(A) 538 (B) -538 (C) 27 (D) -27

73. Mixing of non-reacting gases is generally accompanied by

(A) Decrease in entropy (B) Increase in entropy

(C) Change in enthalpy (D) Change in free energy

74. The entropy values $(in\ JK^{-1}\,mol^{-1})$ of $H_2(g) = 130.6, Cl_2(g) = 223.0$ and $HCl(g) = 186.7$ at $298\,K$ and $1\ \ atm$ pressure. Then entropy change for the reaction $H_{2(g)} + Cl_{2(g)} \rightarrow 2HCl_{(g)}$ is

(A) 540.3 (B) 727.3 (C) -166.9 (D) 19.8

75. The enthalpy of water is $386\,kJ$. What is entropy of water.....kJ

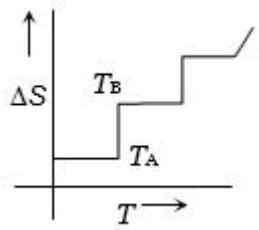
(A) 0.5 (B) 1.03 (C) 1.5 (D) 22.05

76. The standard entropies of $CO_2(g), C(s)$ and $O_2(g)$ are $213.5, 5.740$ and $205\ \ JK^{-1}$ respectively. The standard entropy of formation of CO_2 is.....JK^{-1}

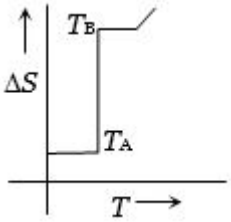
(A) 2.76 (B) 2.12 (C) 1.12 (D) 1.40

77. If for a given substance melting point is T_B and freezing point is T_A, then correct variation shown by graph between entropy change and temperature is

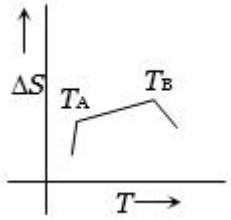
(A)



(B)



(C)



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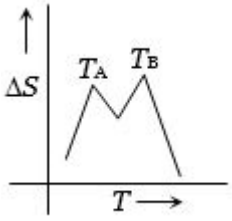


78. The entropy values (in $JK^{-1}\ \ mol^{-1}$) of $H_{2(g)} = 130.6, Cl_{2(g)} = 223.0$ and $HCl_{(g)} = 186.7$ at $298\,K$ and $1\ atm$ pressure. Then entropy change for the reaction $H_{2(g)} + Cl_{2(g)} \rightarrow 2HCl_{(g)}$ is :-

(A) $+540.3$ (B) $+727.3$ (C) -166.9 (D) $+19.8$

79. The heat of vaporisation and heat of fusion of H_2O are $540\,cal/g$ and $80\,cal/g$. The ratio of $\frac{\Delta_S vap}{\Delta_S fusion}$ for water is :-

(A) 6.75 (B) 9.23 (C) 4.94 (D) 0.2

80. For a cell,

$4B(s) + 3O_2\,(g) \rightarrow 2B_2O_3\,(g)$; $E^o_{cell} = 1.433\ volt$ What is molar entropy (in J/K) of oxygen gas

Given $(\Delta_f H^o)_{B_2O_3}(g) = -840\ \frac{KJ}{mol}$

$(S_m^o)_{B_2O_3}(g) = 280 J/K - mol$

$(S_m^o)_B\ (s) = 10\ J/K - mol$

(A) 0.1963 (B) 1.963 (C) 15.03 (D) 150.3

81. Which of the following reaction has positive entropy change ?

(A) $N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$

(B) $H_2O(s) \rightarrow H_2O(l)$

(C) $C_{graphite} \rightarrow C_{diamond}$

(D) $CO_2(g) + H_2O(l) \rightarrow H_2CO_3(aq)$

82. The enthalpy change for transition of liquid water to steam is $3.73\,KJ\,mol^{-1}$ at $373\,K$. Find ΔS in $J/mol\,K$ .....$J/mol\,K$

(A) 100 (B) 10

(C) 1000 (D) None of the above

83. Melting point of a solid is $x\,K$ and its latent heat of fusion is $600\,cal\,mol^{-1}$. The entropy change for fusion of $1\,mol$ solid is $2\,cal\,mol^{-1}\,K^{-1}$. The value of x will be.....K

(A) 100 (B) 200 (C) 300 (D) 400

84. The ΔH and ΔS for a reaction at one atmospheric pressure are $+30.558\,kJ$ and $0.066\,kJ\,k^{-1}$ respectively. The temperature at which the free energy change will be zero and below of this temperature the nature of reaction would be

(A) $483\,K$, spontaneous (B) $443\,K$, non-spontaneous

(C) $443\,K$, spontaneous (D) $463\,K$, non-spontaneous

85. For a reaction $\Delta H = 9.08\,kJ\,mol^{-1}$ and$\Delta S = 35.7\,JK^{-1}mol^{-1}$Which of the following statements is correct for the reaction

(A) Reversible and Isothermal

(B) Reversible and Exothermic

(C) Spontaneous and Endothermic

(D) Spontaneous and Exothermic

86. Which of the following is not a correct statement?

(A) When ΔG is negative, the process is spontaneous

(B) When ΔG is zero, the process is in a state of equilibrium

(C) When ΔG is positive, the process is non-spontaneous

(D) None of these

87. Values of ΔH and ΔS for five different reactions are given below. On the basis of these values predict which one of these will be spontaneous at all tempeature

Reaction	$\Delta H(KJ\ mol^{-1})$	$\Delta S(JK^{-1}\ mol^{-1})$
I	$+98.0$	$+14.8$
II	-55.5	-84.6
III	$+28.3$	-17.0
IV	-40.5	$+24.6$
V	$+34.7$	0.0

(A) Reaction I (B) Reaction II (C) Reaction III (D) Reaction IV

88. For reaction $Ag_2O(s) \rightarrow 2Ag(s) + (1/2)O_2(g)$ the value of $\Delta H = 30.56\ kJ\ mol^{-1}$ and $\Delta S = 0.066\ kJK^{-1}\ mol^{-1}$. Temperature at which free energy change for reaction will be zero, is ..... K

(A) 373 (B) 413 (C) 463 (D) 493

89. The enthalpies of combustion of $S(s)$ and $H_2(g)$ are -300 and $-290\ kcal\ mol^{-1}$.
Given $SO_3(g) + H_2O(l) \rightarrow H_2SO_4(l)$
$\Delta H = -130\ kcal\, mol^{-1}$
$SO_2(g) + 1/2O_2(g) \rightarrow SO_3(g)$
$\Delta H = -100\ kcal\ mol^{-1}$
the enthalpy of formation of $H_2SO_4(l)$ would be .....$kcal\, mol^{-1}$

(A) -300 (B) -130 (C) -820 (D) -560

90. For the reaction
$X_2O_4(g) \rightarrow 2XO_2(g)$
$\Delta U = 2.1\, kcal, \Delta S = 20\, cal\, K^{-1}$ at $300\, K$.
Hence ΔG is ....$kcal$

(A) 2.7 (B) -3.3 (C) 9.3 (D) None

91. $\Delta S_{\text{Total}} = -40\ kJ/mol - K$
$\Delta H_{\text{System}} = 2000\ kJ/mol$
$T = 400\ K$
Find out value of ΔS_{System} .....$kJ/mol - K$

(A) -35 (B) -10 (C) -40 (D) -5

92. For the reaction $PCl_5 \rightarrow PCl_3 + Cl_2, \Delta H = 75\, KJ\, mol^{-1}$ and $\Delta S = 120\, JK^{-1}\, mol^{-1}$. At which temperature reaction is spontaneous.....K

(A) 625 (B) 610 (C) 630 (D) 600

93. Standard entropies for H_2, Cl_2 and HCl is $60, 40$ and $60\, Jk^{-1}$ respectively. For reaction $H_2 + Cl_2 \rightleftharpoons 2HCl,\ \Delta H = +30\, kJ$ to be at equilibrium, the temperature will be .....K

(A) 2500 (B) 100 (C) 1500 (D) 1.5

94. For the reaction at $300\,K$

$A(g)+B(g)\rightarrow C(g)\quad \Delta U=-3\,Kcal$

$$\Delta S=-10\,cal/K$$

value of ΔG will be .....cal

(A) -600 (B) -6600 (C) -6000 (D) -60

95. The maximum work done in expnading $16\,g\,O_2$ isothermally at $300\,K$ and occupying a volume $5\,dm^3$ until the volume becomes $25\,dm^3$ is

(A) $-2.01\times10^3\,J$ (B) $2.01\times10^{-3}\,J$ (C) $+2.81\times10^3\,J$ (D) $+2.01\times10^{-6}\,J$

96. Consider the following reaction

$C_6H_6(l)+\frac{15}{2}\,O_2(g)\rightarrow 6\,CO_2(g)+3H_2O\,(g)$

Signs of ΔH, ΔS and ΔG for the above reaction will be

(A) $+,-,+$ (B) $-,+,-$ (C) $-,+,+$ (D) $+,+,-$

97. Which of the following relation is incorrect

(A) $Kp=\left(\frac{e}{RT}\right)^{\Delta G^o}$ (B) $Kp=e^{-\frac{\Delta G^o}{RT}}$

(C) $\Delta G^o=-2.303\,RT\log Kp$ (D) $\log K_{eq}=\frac{-\Delta G^o}{2.303\,RT}$

98. For the fuel cell reaction

$2H_2(g)+O_2(g)\rightarrow 2H_2O(l)\;\;;\quad \Delta_f H^o_{298}(H_2O(l))=-285.5\,kJ/mol$

What is ΔS^o_{298} for the given fuel cell reaction ?

Given : $O_2(g)+4H^+(aq)+4e^-\rightarrow 2H_2O(l)\quad E^o=1.23\,V$

(A) $-0.322\,J/K$ (B) $-0.635\,kJ/K$ (C) $3.51\,kJ/K$ (D) $-0.322\,kJ/K$

99. Three moles of an ideal gas expanded spontaneously into vacuum. The work done will be ..... Joules

(A) infinite (B) 3 (C) 9 (D) 0

100. During an isothermal expansion of an ideal gas its

(A) Internal energy increases

(B) Enthalpy decreases

(C) Enthalpy remains unaffected

(D) Enthalpy reduces to zero

101. 1 mole of a diatomic is heated through isochoric process from $300\,K$ to $500\,K$. The entropy is :

(A) 10.61 (B) 38.26 (C) 20.05 (D) 30

102. Enthalpy of combustion of CH_4, C_2H_6 and C_3H_8 are $-210.8, -368.4$ and $-526.2\,k\,cal\,mol^{-1}$ respectively. Enthalpy of combustion of hexane can be predicted as.....$k\,cal\,mol^{-1}$

(A) -840 (B) -684 (C) -1000 (D) none of these

103. ΔS_{surr} for an exothermic reaction is

(A) always positive

(B) always negative

(C) zero

(D) may be positive or negative

104. ΔH_{fusion} of a substance is $'x'$ and ΔH_{vap} is $'y'$, then $\Delta H_{sublimation}$ will be

(A) $x+y$ (B) $x-y$ (C) x/y (D) y/x

105. The heat of neutralisation of a strong acid and a strong alkali is $57.0\,kJ\,mol^{-1}$. The heat released when $0.5\,mole$ of HNO_3 solution is mixed with $0.2\,mole$ of KOH is.....kJ

(A) 57 (B) 11.4 (C) 28.5 (D) 34.9

106. Assertion : During an adiabatic process, heat energy is not exchanged between system and its surroundings.
Reason : The temperature of a gas increases when it undergoes an adiabatic expansion.

(A) If both Assertion and Reason are correct and the Reason is a correct explanation of the Assertion.

(B) If both Assertion and Reason are correct but Reason is not a correct explanation of the Assertion.

(C) If the Assertion is correct but Reason is incorrect.

(D) If both the Assertion and Reason are incorrect.

107. Assertion : Mass and volume are extensive properties.
Reason : Mass / volume is also an extensive parameter.

(A) If both Assertion and Reason are correct and the Reason is a correct explanation of the Assertion.

(B) If both Assertion and Reason are correct but Reason is not a correct explanation of the Assertion.

(C) If the Assertion is correct but Reason is incorrect.

(D) If both the Assertion and Reason are incorrect.

108. The internal energy of a substance

(A) Increases with increase in temperature

(B) Decreases with increase in temperature

(C) Can be calculated by the relation $E=mc^2$

(D) Remains unaffected with change in temperature

109. Which of the following is not a state function

(A) Internal energy (B) Enthalpy (C) Work (D) Entropy

110. In thermodynamics, a process is called reversible when

(A) Surroundings and system change into each other

(B) There is no boundary between system and surroundings

(C) The surroundings are always in equilibrium with the system

(D) The system changes into the surroundings spontaneously

111. Work done during isothermal expansion of one mole of 1 mole of an ideal gas from $10\ atm$ to 1 atm at $300\,K$ is.....cal (Gas constant $= 2$)

(A) 938.8 (B) 1138.8 (C) 1381.8 (D) 1581.8

112. Assertion : Entropy of ice is less than water.
Reason : Ice has cage like structure.

(A) If both Assertion and Reason are correct and the Reason is a correct explanation of the Assertion.

(B) If both Assertion and Reason are correct but Reason is not a correct explanation of the Assertion.

(C) If the Assertion is correct but Reason is incorrect.

(D) If both the Assertion and Reason are incorrect.

113. Hess law is applicable for the determination of heat of

(A) Reaction (B) Formation (C) Transition (D) All of these

114. In an endothermic reaction, the value of ΔH is

(A) Zero (B) Positive (C) Negative (D) Constant

115. The enthalpy change of a reaction does not depend on

(A) The state of reactants and products

(B) Nature of reactants and products

(C) Different intermediate reaction

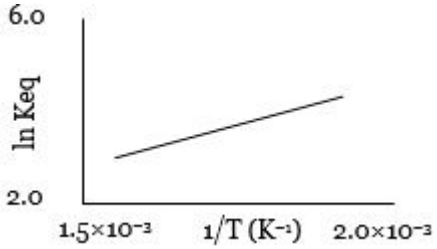
(D) Initial and final enthalpy change of a reaction

116. A well stoppered thermos flask contains some ice cubes. This is an example of a

(A) Closed system (B) Open system

(C) Isolated system (D) Non-thermodynamic system

117. A schematic plot of versus inverse of temperature for a reaction is shown below
The reaction must be



(A) Exothermic

(B) Endothermic

(C) One with negligible enthalpy change

(D) Highly spontaneous at ordinary temperature

118. If the bond dissociation energies of XY, X_2 and Y_2 (all diatomic molecules) are in the ratio of $1:1:0.5$ and $\Delta_f H$ for the formation of XY is $-200\,kJ\,mole^{-1}$. The bond dissociation energy of X_2 will be.....$kJ\,mol^{-1}$

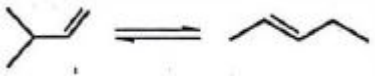
(A) 100 (B) 800 (C) 300 (D) 400

119. If at $298\,K$ the bond energies of $C-H, C-C,\ C=C$ and $H-H$ bonds are respectively $414, 347, 615$ and $435\,kJ\ mol^{-1}$, the value of enthalpy change for the reaction

$H_2C=CH_2(g)+H_2(g)\rightarrow H_3C-CH_3(g)$ at $298\,K$ will be ....kJ

(A) $+250$ (B) -250 (C) $+125$ (D) -125

120. The heat of hydrogenation for 3 -methylbutene and 2 -pentene are $-30\,kcal/mol$ and $-28\,kcal/mol$ respectively. The heats of combustion of 2 -methylbutane and pentane are - $784\,kcal/mol$ and $-782\,kcal/mol$ respectively. All the values are given under standard conditions. Taking into account that combustion of both alkanes give the same products, what is ΔH (in $kcal/mol$) for the following reaction under same conditions ?



(A) 0 (B) -4 (C) -2 (D) 2

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