CHEMISTRY

BOOKS - BRILLIANT PUBLICATION

THERMODYNAMICS AND CHEMICAL ENERGETICS

Level I Homework

1. Which one of the following is a path function?

A. Temperature

B. Potential energy

C. Work

D. Enthalpy

Answer:

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2. Which of the following is an extensive property?

A. Enthalpy

B. Concentration

C. Density

D. Viscosity

Answer:

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3. Classify the following as open, closed or isolated system

i) A beaker containing open boiling water

ii) A chemical reaction in a closed vessel

iii) A cup of tea placed on a table

iv) Hot water in perfectly insulated closed container

A. $i\&iii, ii, iv$

B. $i\&ii, iii, iv$

C. $iii\&iv, ii, i$

D. $ii\&iv, i, iii$

Answer:

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4. For a process at constant volume

A. $w = 0 \text{ and } \Delta U = \Delta H$

B. $w = 0 \text{ and } \Delta U = q$

C. $q = 0, w = 0 \Delta U = 0$

D. $w = 0 \text{ and } \Delta U = 0$

Answer:

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5. The difference between ΔH and ΔU for the combustion of toluene (C_7H_8) at 300 K is

A. $-2RT$

B. $-4RT$

C. $+2RT$

D. $+4RT$

Answer:

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6. Which of the following represents the standard heat of formation of $C_2H_4(g)$?

A. $2C_{(\text{diamond})} + 2H_{2(g)} \rightarrow C_2H_{4(g)}$

B. $2C_{(\text{graphite})} + 2H_{2(g)} \rightarrow C_2H_{4(g)}$

C. $2C_{(\text{diamond})} + 4H_{2(g)} \rightarrow C_2H_{4(g)}$

D. $2C_{(\text{graphite})} + 4H_{2(g)} \rightarrow C_2H_{4(g)}$

Answer:

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7. 1)During adiabatic process $\Delta u = W_{ad}$

2) W = 0 for isothermal expansion of ideal gas into vacuum

3) For isothermal irreversible change from V_1 to V_2, $Q = -W = P_{ext}(V_2 - V_1)$

4) Q_P is a state property

Which of these statements are correct

A. 1, 2, 3

B. 1, 3, 4

C. All

D. 1, 2, 4

Answer:

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8. The standard enthalpy change for the neutralisation of HCN with NaOH is

-2460 cal at 298 K. Given that standard enthalpy change for the neutralisation HCl with NaOH is -13.7 kcal. What is enthalpy of ionisation of HCN in $kcal$?

A. 11.2

B. 15.2

C. 9.2

D. 12.2

Answer:

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9. The species which by definition has zero standard molar enthalpy of formation at 298 K is

A. $Br_{2(g)}$

B. $Cl_{2(g)}$

C. $H_2O_{(g)}$

D. $CH_{4(g)}$

Answer:

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10. The bond energy is the energy required to

A. Dissociate one mole of the substance

B. Dissociate bond in 1 kg of the substance

C. Break one mole of similar bonds

D. Break bonds in 1 mole of substance

Answer:

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11. In which of the following reactions the heat liberated is known as heat of combustion.

A. $H^+ + OH^- \rightarrow H_2O +$ heat

B. $C_{(\text{graphite})} + 1/2O_2(g) \rightarrow CO_{(g)} +$ heat

C. $CH_{4(g)} + 2O_{2(g)} \rightarrow CO_{2(g)} + 2H_2O_{(l)} +$ heat

D. $H_2SO_4 + 1/2O_{2(g)} \rightarrow CO_{(s)} +$ heat

Answer:

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12. The enthalpies of combustion of S, SO_2 and H_2 are $-298.2, -98.7$ and $-287.3.\ kJmol^{-1}$ respectively. If enthalpy of the

reaction $SO_{x(g)} + H_2O_{(f)} \rightarrow H_2SO_{4(f)} is -130.2kJmol^{-1}$, the enthalpy of formation of H_2SO_4 is

A. $-814kJmol^{-1}$

B. $-650.3kJmol^{-1}$

C. $-554.2kJmol^{-1}$

D. $-435.5kJmol^{-1}$

Answer:

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13. Calculate ΔH_r^{θ} for reaction $H_2(g) + Br_2(g) \rightarrow 2HBr(g)$ given that the bond energies of H-H, Br-Br and H-Br are 435, 192 and 364 kJmol^{-1} respectively.

A. $-103kJmol^{-1}$

B. $-51.5kJmol^{-1}$

C. $-159kJmol^{-1}$

D. $+103kJmol^{-1}$

Answer:

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14. If $\frac{1}{2}X_2O_{(s)} \rightarrow X_s + \frac{1}{4}O_{2(g)}\,\Delta H = 90KJ$ then heat exchange during reaction of metal X with one mole of O_2 to form oxide to maximum extent is

A. 360 kJ

B. $-360kJ$

C. $180kJ$

D. $-180kJ$

Answer:

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15. Enthalpy of vapourisation of liquid water is 41 kJ mol^{-1} at 373 K. The change of internal energy when 1mole water at 373 K is converted to steam at 373 K is

A. 38 kJ

B. 38 J

C. 21 J

D. $2.1kJ$

Answer:

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16. For the reversible isothermal process ΔS is given by (1) ΔH / ΔT (2) T /q (3) q × T (4) q rev / T

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

B. $\frac{T}{q}$

C. $q \times T$

D. $\frac{q_{rev}}{T}$

Answer:

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17. Fusion of ice to form water liquid $H_2O_{(g)} \xrightarrow{0^\circ C} H_2O_{(l)}$ is spontaneous because (1) ΔH = - ve (2) ΔH = + ve (3) ΔS = + ve (4) ΔS = - ve

A. $\Delta H = -ve$

B. $\Delta H = +ve$

C. $\Delta S = +ve$

D. $\Delta S = -ve$

Answer:

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18. Molar heat capacity at constant pressure of aluminium is $24JK^{-1}mol^{-1}$. Quantity of heat to raise the temp of 3g metallic aluminium from$30^{\circ}C$ to $70^{\circ}C$ is

A. 96 J

B. 288 J

C. $106.7J$

D. $106.7kJ$

Answer:

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19. For a reaction$A+B\rightarrow C-$ heat, Δs is $-ve,$ the reaction

A. will be feasible at high temperature

B. will be feasible at low temperature

C. will be feasible at all temperature

D. will not occur in the forward direction

Answer:

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20. Change in entropy of an isochoric process is given by the expression

A. $C_P \frac{\ln(T_2)}{T_1}$

B. $C_v \frac{\ln(T_1)}{T_2}$

C. $R \frac{\ln(P_1)}{P_2}$

D. $2.303 n C_v \log \frac{T_2}{T_1}$

Answer:

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21. For a reversible reaction at equilibrium $\Delta S_{syst} + \Delta S_{surr}$ is

A. > 0

B. < 0

C. $= 0$

D. none

Answer:

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22. In adiabatic process, pressure is proportional to cube of temperature, find poisson's ratio γ

A. $2/3$

B. $3/2$

C. $1/3$

D. $4/3$

Answer:

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23. If the dissociation energies of 'CH_4' and 'C_2 H_6' are 360 and '620 kcal/ mol' respectively, then the bond energy of 'C -C' bond is

A. 130 kcal mol^{-1}

B. 80 kcal mol^{-1}

C. 180 kcal mol^{-1}

D. 260 kcal mol^{-1}

Answer:

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24. The least random state of water sytem is

A. ice

B. liquid water

C. steam

D. randomness is same in all

Answer:

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25. For the gas phase reaction $PCl_{5(g)} \rightarrow PCl_{3(g)} + Cl_{2(g)}$ which of the following conditions are correct?

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

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

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

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

Answer:

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26. Which of the following is not an endothermic reaction?

A. Combustion of methane

B. Decomposition of water

C. Dehydrogenation of ethane to ethylene

D. Conversion of graphite to diamond

Answer:

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27. Which law of thermodynamics help in calculating entropy at different temperatures?

A. first law

B. second law

C. third law

D. zeroth law

Answer:

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28. An amount of 3 mole $H_2O(l) at 100^\circ C$ and 1 atm is converted into $H_2O(g) at 100^\circ C$ and 5 atm. ΔG for the process is

A. Zero

B. 1720 ln 5 cal

C. -2238ln 5 cal

D. 2238 ln 5 cal

Answer:

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29. When enthalpy and entropy change of a reaction are -2.5×10^3 cal and 7.4 cal respectively. Predict that the reaction at 298 K is

A. Spontaneous

B. Non spontaneous

C. Irreversible

D. Reversible

Answer:

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30. Equilibrium constant of a reaction is 10, what will be the value of ΔG° (in kcal mol^{-1}) at 298 K?

A. -4.6

B. -1.37

C. 46

D. 4606

Answer:

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31. The incorrect statement is (1) We can describe the state of a gas by quoting its pressure, volume, temperature, amount etc (2) Variables like P, V, T are called state variables or state functions (3) In order to completely define the state of a system all the properties of the system should be defined. (4) The state of the surroundings can never be completely specified

A. we can describe the state of a gas by quoting its pressure, volume, temperature, amount etc

B. variables like P, V, T are called state variables or state functions

C. in order to completely define the state of a system all the properties of the system should be defined

D. the state of the surroundings can never be completely specified

Answer:

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32. Internal energy U of a system may change when

A. heat passes into or out of the system

B. work is done on or by the system

C. matter enters or leaves the system

D. all the above

Answer:

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33. A system is said to be in thermodynamic equilibrium when

A. there is chemical equilibrium

B. there is thermal equilibrium

C. there is mechanical equilibrium

D. all the above equilibria simultaneously exist

Answer:

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34. Pick out the wrong statement

A. mode of energy transferred due to difference in temperature is heat

B. mode of energy transferred due to difference in pressure is work

C. energy transferred due to difference in pressure depends only on initial and final pressure

D. in an isolated system, no energy can be exchanged between system and surroundings

Answer:

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35. Triple point of water is the temperature at which

A. ice is in equilibrium with water

B. water is in equilibrium with water vapour

C. ice is in equilibrium with water vapour

D. ice, liquid water and water vapour are in equilibrium

Answer:

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36. C (diamond) $+O_2(g) \rightarrow CO_{2(g)}, \Delta H = -398kJ$

$C_{(\text{graphicle})} + O_{2(g)} \rightarrow CO_{2(g)}, \Delta H = -395kJ$

the heat liberated when 1g diamond is converted to 1g graphite is

A. 3 kJ

B. $-3kJ$

C. $250J$

D. $-250J$

Answer:

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37. Which of the following represents standard heat of formation of water?

A. $2H_2(g) + O_2(g) \rightarrow 2H_2O(l), \Delta H = 2xJ$

B. $H_2(g) + \frac{1}{2}O_2(g) \rightarrow H_2O(l), \Delta H = xJ$

C. $H_2(g) + O(g) \rightarrow H_2O(l), \Delta H = yJ$

D. $CH_4(g) + 2O_2(g) \rightarrow CO_2(g) + 2H_2O(l), \Delta H = zJ$

Answer:

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38.

$\Delta H_{\text{combustion}} of C_6H_6(l).\ C(s)$ and $H_2(g) are -3000kJ,\ -390KJmol^{-1}$ a

respectively. Hence heat of formation of benzene, is

A. $-210kJmol^{-1}$

B. $210kJmol^{-1}$

C. $3680kJmol^{-1}$

D. $-3680kJmol^{-1}$

Answer:

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39. $H_2 \to 2H, \Delta H = 430kJ$

$F_2 \to 2F, \Delta H = 148kJ$

$2HF \to H_2 + F_2, \Delta H = 530kJ$

Bond energy of HF bond is

A. $1108kJmol^{-1}$

B. $-1108kJmol^{-1}$

C. $-554kJmol^{-1}$

D. $554kJmol^{-1}$

Answer:

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40. 2 moles of a mixture of acetylene and ethane produced on combustion, 5500 kJ of heat energy. The enthalpies of combustion of acetylene and ethane are 2000 and 3000 kJ mol^{-1} respectively. The ratio of acetylene to ethane in the mixture is

A. $1:3$

B. $1:1$

C. $3:1$

D. $1:2$

Answer:

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41. The enthalpies of combustion of monoclinic sulphur and rhombic sulphur are -71030 and - 70960 cal respectively. The enthalpy change of the transition of monoclinic sulphur to rhombic sulphur is

A. -70 cal mol^{-1}

B. $+70$ cal mol^{-1}

C. 140 cal mol^{-1}

D. -140 cal mol^{-1}

Answer:

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42. One mole of methane undergoes combustion to form CO_2 and water at 25^oC. The difference between ΔU & ΔH will be

A. $-2RT$

B. $3RT$

C. RT

D. 0

Answer:

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43. The enthalpy of formation of NaCl(s) is $-411.2kJmol^{-1}$. The enthalpy of sublimation of Na(s), its ionization enthalpy in the gaseous state, the bond energy of chlorine, its electron gain enthalpy are $108.4, 495.6, 242$ and $-348.6kJmol^{-1}$ respectively. The energy required to break one mole of solid sodium chloride into its ions in the gaseous state is (in kJ)

A. 783.4

B. -783.4

C. 502.4

D. -502.4

Answer:

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44. A gas expands from 1l to 6l against a constant pressure of 1 atm and it absorbs 500J of heat ΔU is

A. $6.5J$

B. $-6.5J$

C. 0

D. 500 J

Answer:

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Level Ii Homework

1. Which of the following is an intensive property

A. internal energy

B. Gibbs energy

C. Entropy

D. Molar heat capacity

Answer:

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2. Which one of the following equations correctly represent the first law of thermodynamics for the given process occuring in an ideal gas

A. Cyclic process q = w

B. isothermal process q = w

C. adiabatic process $\Delta u = -w$

D. expansion of a gas into vacuum $\Delta u = q$

Answer:

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3. A6L cylinder contains 10 mol oxygen gas at $27^{\circ}C$. If the whole gas escapes isothermally into atmosphere having a pressure of 1 atm, how much work is done by the gas

A. $-506.5kJ$

B. $-24.3kJ$

C. $-240kJ$

D. $-240kJ$

Answer:

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4. The work done on the system when one mole of an ideal gas is compressed isothermally to a final volume of $0.01m^3$ at constant external pressure of 5 bar is 20 kJ. What is initial volume of the gas?

A. $0.05m^3$

B. $0.025m^3$

C. $0.04m^3$

D. $0.03m^3$

Answer:

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5. Agas is allowed to expand in a well-insulated container against a constant external pressure of 2.5 atm from 2.5 L to 4.5 L. The change in internal energy of the gas

A. $-506.5J$

B. $-5.06kJ$

C. 1136 J

D. Zero

Answer:

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6. 64 g of oxygen (assume ideal behaviour) at $27^{\circ}C$ undergoes reversible isothermal expansion from 2.5 L to 25 L. The values of delta U, w and q are (in cal)

A. $0, 2764, -2764$

B. $0, \ -2764, 2764$

C. $2764, \ -2764, 0$

D. $-2764, 0, 2764$

Answer:

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7. The difference of heat of reaction at constant pressure and at constant volume for combustion of 2 mol of liquid benzene at 300 K

A. $3.74KJ$

B. $-7.48KJ$

C. $-3.74KJ$

D. $7.48KJ$

Answer:

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8. ΔH_f^0 values of $NH_2 - OH_{(s)}$, $NH_{3(g)}$, $N_2H_{4(l)}$ and $NH_4NO_{3(s)}$ are respectively (in kJ mol^{-1}) -114, 294, 50.6 and -365.5. The order of increasing stability with respect to decomposition into their elements is.

A. $NH_4NO_{3(s)} < NH_2 - OH_{(s)} < N_2H_{4(l)} < NH_{3(g)}$

B. $NH_{3(g)} < N_2H_{4(l)} < NH_2OH_{(s)} < NH_4NO_{3(s)}$

C. $NH_{3(g)} < N_2H_{4(l)} < NH_2OH_{(s)} < NH_4NO_{3(s)}$

D. $NH_{3(g)} < NH_2 - OH_{(s)} < N_2H_{4(l)} < NH_4NO_{3(s)}$

Answer:

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9. A cylinder of cooking gas is assumed to contain 14.2 kg butane (C_4H_{10}) combustion of butane is

$$C_4H_{10(g)} + \frac{13}{2}O_{2(g)} \rightarrow 4CO_{2(g)} + 5H_2O_{(l)}, \Delta H = -1660kJ$$

If a family needs 14000 kJ of energy per day for cooking and assuming

that 20% of the gas is wasted due to incomplete combustion, how long would the cylinder last?

A. 37 days

B. 18 days

C. 23 days

D. 30 days

Answer:

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10. $H_2 + \frac{1}{2}O_2 \rightarrow H_2O, \Delta H = -68$ kcal

$K + H_2O + aq \rightarrow KOH_{(aq)} + \frac{1}{2}H_2, \Delta H = -48$ kcal

$KOH + aq \rightarrow KOH_{(aq)}, \Delta H = -14$kcal

From the above data $\Delta H_{(f)}$ of KOH in kcal is

A. -130

B. 130

C. $+102$

D. -102

Answer:

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11. The standard enthalpies of combustion ofC_2H_5 (g) and ethanol are -393.5, -286 and -1368 kJ respectively. The heat of formation of ethanol is : $-277kJmol^{-1}, +277kJmol^{-1}, -554kJmol^{-1}, +554kJmol^{-1}$

A. $-277kJmol^{-1}$

B. $+277kJmol^{-1}$

C. $-554kJmol^{-1}$

D. $+554kJmol^{-1}$

Answer:

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12. ΔH_f^0 of H_2O , CO_2 and sucrose $(C_{12}H_{22}O_{11})$ are respectively (in kJ mol^{-1}) $-286,\ -393.5$ and -2222 . Enthalpy of combustion of sucrose is

A. $-5466kJmol^{-1}$

B. $-5646kJmol^{-1}$

C. $-2823kJmol^{-1}$

D. $+5466kJmol^{-1}$

Answer:

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13. When 0.2 g of 1-butanol was burnt in a suitable apparatus, the heat evolved was sufficient to raise the temperature of 200 g water by $5^\circ C$. The values of enthalpy of combustion and calorific value of 1butanol are [kcal]

A. $-370, \ -5$

B. $+370, 5$

C. $-370, 5$

D. $+370, \ -5$

Answer:

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14. The specific heat at constant volume and constant pressure for a gas are 0.075 and 0.125 cal/g respectively. The molecular weight and atomicity of the gas is

A. 40u, triatomic

B. 40u, monoatomic

C. 80u, diatomic

D. 80u, polyatomic

Answer:

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15. One mole of an ideal gas is allowed to expand reversibly and adiabatically from a temperature $27^{\circ}C$. If work done during the process is 3kJ final temperature of the gas is $(C_v = 20JK^{-1}mol^{-1}]$

A. 150 K

B. 200K

C. 175 K

D. 225 K

Answer:

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16. 1.22 g of benzoic acid on combustion in a Bomb calorimeter was found to raise the temperature of the calorimeter system from 298 K to 298.5 K. If the heat capacity of calorimeter system is 64.5 kJ, heat of combustion of benzoic acid at constant volume is

A. $-3225kJmol^{-1}$

B. $3225kJmol^{-1}$

C. $-3934kJmol^{-1}$

D. $+3934kJmol^{-1}$

Answer:

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17. 200 ml 0.1 M H_2SO_4 is mixed with 200 ml 0.2 M NaOH. The heat generated due to neutralisation is

A. $-1142J$

B. $-114.2kJ$

C. $-228kJ$

D. $-2280J$

Answer:

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18. In experiment I 200 ml 0.1 M NaOH is mixed with 100 ml $0.1MH_2SO_4$. In experiment II 100 ml 0.1 M NaOH is mixed with 50 ml $0.1MH_2SO_4$. Select the correct statement.

a) Heat liberated in each of the two reactions is 274 cal

b) Heat liberated in I is 274 cal and II is 137 cal

c) Temperature rise in I is more than that in II

d) Temperature rise in I is equal to the temperature rise in II

A. a, d

B. b, d

C. b,c

D. a,c

Answer:

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19. The enthalpies of solution for copper sulphate pentahydrate and anhydrous copper sulphate are a respectively $+11.7$ and $-65.5kJmol^{-1}$. The hydration enthalpy of anhydrous copper sulphate is

A. $-53.8kJmol^{-1}$

B. $53.8kJmol^{-1}$

C. $-77.2kJmol^{-1}$

D. $77.2kJmol^{-1}$

Answer:

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20. Enthalpy of vaporisation of benzene is 30.8 kJ mol" at its normal boiling point of $80^{\circ}C$. Time required for a 100 W electric heater to vapourise 100 g benzene at its boiling point (Given 1W = 1 Js^{-1})

A. 395 minutes

B. 51.3 minutes

C. 513 sec.

D. 6.6 min

Answer:

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21. $CCl_{4(f)}$ boils at 350 K at 1 atm. pressure absorbing $30kJmol^{-1}$. The change in internal energy when 154 g of liquid carbon tetrachloride vaporises at 350 K and 1 atm is

A. 30 kJ

B. $2.79kJ$

C. $27.9kJ$

D. $-27.1kJ$

Answer:

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22. Consider the reaction

$4NO_{2(g)} + O_{2(g)} \rightarrow 2N_2O_{5(g)}, \Delta H = -111kJ$

If $N_2O_{5(s)}$ is formed in the above reaction ΔH will be (Given ΔH for sublimation of N_2O_5 is 54 kJ)

A. $-165kJmol^{-1}$

B. $+54kJmol^{-1}$

C. $+219kJmol^{-1}$

D. $-219kJmol^{-1}$

Answer:

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23. 0.8 mole He and 0.2 mole H, maintained at same pressure are isothermally mixed. ΔS_{mix} is

A. Zero

B. 1 cal/k

C. 0.32 cal/k

D. 5 cal/k

Answer:

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24. For the reaction $X_2O_{4(l)} \rightarrow 2XO_{2(g)}, \Delta u = 2.1 kcal mol^{-1}, \Delta S = 20 cal K^{-1} mol^{-1} at$

300 K. Calculate ΔG and predict whether the reaction is spontaneous at 300 K

A. -2.7 kcal, spontaneous

B. $+2.7$ kcal, spontaneous

C. $+9.3$ kcal, spontaneous

D. -9.3 kcal, spontaneous

Answer:

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25. Given $PbO_{(s)} + C_{(s)} \rightarrow Pb_{(s)} + CO_{(g)}$, $\Delta H = 108 kJ mol^{-1}$ and $\Delta S = 190 JK^{-1} mol^{-1}$, reduction of $PbO_{(s)}$ is spontaneous

A. Below $296^{\circ} C$

B. Spontaneous at all temperatures

C. Non spontaneous at all temperatures

D. Above $296^{\circ} C$

Answer:

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26. A reaction has value of $\Delta H = -40 kcal mol^{-1}$ at 400 K. Below 400 K the reaction is spontaneous and above 400 K it is not. The value of ΔG and ΔS at 400 K are respectively

A. $0, -0.1 cal K^{-1} mol^{-1}$

B. $0, 100 cal K^{-1} mol^{-1}$

C. $10 kcal mol^{-1}, -100 cal K^{-1} mol^{-1}$

D. $0, -100 cal K^{-1} mol^{-1}$

Answer:

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27. Calculate free energy change at $27^\circ C$ for the reaction

$H_2 + Cl_2 \rightarrow 2HCl$

Given bond enthalpies of H_2, Cl_2 and HCl are 435, 240 and 430 kJ mol^{-1} respectively and entropies of H_2, Cl_2 and HCl are 131,223 and 187 JK^{-1} respectively

A. $-200kJmol^{-1}$

B. $+191kJmol^{-1}$

C. $-191kJmol^{-1}$

D. zero

Answer:

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28. ΔG_f^0 of $NH_{3(g)}$, NO and $H_2O_{(l)}$ are respectively (in kJ mol^{-1}) $-16.3, 86.5, -237$. What is log K for the reaction $4NH_{3(g)} + 5O_{2(g)} \rightarrow 4NO_{(g)} + 6H_2O_{(l)}$

A. -1011

B. 10.76

C. -1076

D. 176

Answer:

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29. The standard emf of the cell reaction $Zn_{(s)} + Cu_{aq}^{2+} \rightarrow Zn_{aq}^{2+} + Cu_{(s)}$ 1.1 V. If standard enthalpy change of the reaction is -216.7 kJ, what is standard entropy change of the reaction in $JK^{-1}mol^{-1}$?

A. -147.6

B. -1476

C. -14.76

D. -28.5

Answer:

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30. Consider the following spontaneous reaction $C_6H_5COOH_{(s)} + \frac{15}{2}O_{2(g)} \rightarrow 7CO_{2(g)} + 3H_2O_{(g)}$ sign of $\Delta S, \Delta H$ and ΔG

A. $-, -, -$

B. $-, +, -$

C. $+, -, -$

D. $+, +, -$

Answer:

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31. Given : $PbO_2 \rightarrow PbO \Delta G_{298K} < 0$

$SnO_2 \rightarrow SnO \Delta G_{298K} > 0$

Most probable oxidation state of Pb and Sn will be

A. Pb^{4+}, Sn^{4+}

B. Pb^{4+}, Sn^{2+}

C. Pb^{2+}, Sn^{4+}

D. Pb^{2+}, Sn^{2+}

Answer:

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32. Standard Gibbs free energy change of a reaction is zero. The value of equilibrium constant will be

A. 10

B. 1

C. 100

D. 100

Answer:

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33. For the reactions $4C_{(g)} + 5H_{2(g)} \rightarrow C_4H_{10}$(n-bu tan e)

Delta H ^(@) =- 133.7kJ/mol $\Delta S^{\circ} = -365.8JK^{-}mol^{-1}$

$4C_{(g)} + 5H_{2(g)} \rightarrow C_4H_{10}(Iso)$

$\Delta H^{\circ} = -132.6kJmol^{-1}$

$\Delta S^{\circ} = 381JK^{-1}mol^{-1}$

What is ΔG° for the conversion of n butane to isobutane and predict the nature of the process

A. $-2.32kJmol^{-1}$, spontaneous

B. $+2.32kJ$, non spontaneous

C. $-33kJ$, spontaneous

D. $+33kJ$ non spontaneous

Answer:

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34. Equilibrium pressure for $CaCO_{3(g)}hArCaO_{(s)} + CO_{2(g)}$ is 1 bar at $897^{\circ}C$. What is standard entropy if standard enthalpy is 178 kJ mol e^{-1}

A. $152JK^{-1}mol^{-1}$

B. $1520JK^{-1}$

C. $304JK^{-1}$

D. $3.2kJ.\ K^{-1}$

Answer:

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35. A) For N_2 O gas, the difference in specific heats at constant pressure and at constant volume is equal to 0.04545 cal/g

B) Entropy of a perfectly crystalline solid is zero at absolute zero of temperature

C) Standard Gibbs energy of formation and standard enthalpy of formation are zero for elements in standard state

D) $T\left(\delta S^{0}\_(\text{total}) = \Delta G\right.$

Which of these statements are true?

A. All

B. B,C

C. A,B,C

D. B,C,D

Answer:

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36. Assertion : For the reaction $2NH_{3(g)} \rightarrow N_{2(g)} + 3H_{2(g)}, \Delta H > \Delta U$

Reason : Enthalpy change is always greater than internal energy change

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

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

C. If assertion is true, but reason is false

D. If both assertion and reason are false

Answer:

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37. Assertion : Eventhough HF is a weak acid heat liberated during neutralisation with a strong base is more than $57kJmol^{-1}$

Reason : Hydration energy of F-is very large

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

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

C. If assertion is true, but reason is false

D. If both assertion and reason are false

Answer:

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38. Assertion : At constant temperature and pressure chemical reactions are spontaneous in the direction of decreasing Gibb's energy

Reason : For every chemical reaction at equilibrium standard Gibb's energy of the reaction is zero

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

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

C. If assertion is true, but reason is false

D. If both assertion and reason are false

Answer:

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39. Assertion : Adiabatic expansion of a gas decreases its internal energy.

Reason : Expansion work is done by the gas using its own internal energy.

: If both assertion and reason are true and reason is the correct explanation of assertion, If both assertion and reason are true and reason is not the correct explanation of assertion, If assertion is true, but reason is false, If both assertion and reason are false

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

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

C. If assertion is true, but reason is false

D. If both assertion and reason are false

Answer:

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