# CHEMISTRY

## NCERT - FULL MARKS CHEMISTRY(TAMIL)

## THERMODYNAMICS

**Example**

**1.** From the following data at constant volume for combustion of benzene, calculate the heat of this reaction at constant pressure condition.

$C_6H_{6(1)} + 71/2O_{2(g)} \rightarrow 6CO_{2(g)} + 13H_2O_{(l)}$

Watch Video Solution

**2.** Calculate the enthalpy of combustion of ethylene at 300K at constant pressure if its enthalpy of combustion at constant volume is $-1406\ \mathrm{kJ\ mol^{-1}}$.

Watch Video Solution

**3.** (a) The measured heats of neutralization of acetic acid, formic acid, hydrocyanic acid, and hydrogen sulphide are 13.20, 13.40, 2.90 and 3.80 KCal per g.equiv. respectively. Arrange these acids in a decreasing order of strength.

(b) Heat of neutralization of formic acid by $NH_4OH$ is 11.9 KCal per g.equiv. What is the heat of ionization of $NH_4OH$?

View Text Solution

## Questions A Choose The Correct Answer

**1.** Which of the following is not a statement ?

A. q

B. $q + w$

C. $\Delta H$

D. $V + PV$

**Answer:**

Watch Video Solution

**2.** Which one of the following is not an extensive property ?

A. volume

B. density

C. refractive index

D. molar volume

**Answer:**

Watch Video Solution

**3.** Which of the following is not an endothermic reaction?

A. melting of ice

B. combustion reactions

C. hydrolysis

D. boiling of water

**Answer:**

Watch Video Solution

**4.** Which of the following process is reversible ?

A. Diffusion

B. melting

C. neutralization

D. combustion

**Answer:**

Watch Video Solution

**5.** In which process, work is maximum?

A. reversible

B. irreversible

C. exothermic

D. cyclic

**Answer:**

Watch Video Solution

## Questions B Fill In The Blanks

**1.** Translational energy of molecules is a part of _____energy of the system.

Watch Video Solution

**2.** Specific heat of a liquid system is _____property.

Watch Video Solution

**3.** Work done in the reversible expansion is

Watch Video Solution

**4.** Combustion is an_____ process.

Watch Video Solution

**5.** Heat of neutralisation of a strong acid is ___ than that of a weak acid.

Watch Video Solution

**6.** Name the equipment using which heat of combustion of compounds are determined?

Watch Video Solution

**7.** Energy can be created and be destroyed. State whether this is true or false.

Watch Video Solution

**8.** State Zeroth law of thermodynamic .

Watch Video Solution

**9.** Give the relation between $\Delta U$ and $\Delta H$.

Watch Video Solution

**10.** Define an adiabatic process.

Watch Video Solution

**11.** Write the differences between an exothermic and an endothermic process.

Watch Video Solution

**12.** What are intensive and extensive properties?.

Watch Video Solution

**13.** Define first law of thermodynamics.

Watch Video Solution

**14.** Explain thermal and mechanical equilibrium processes.

Watch Video Solution

## Questions D Explain Briefly On The Following

**1.** Describe a bomb calorimeter and explain how heat of formation of an organic compound is determined.

Watch Video Solution

**2.** Compare the enthalpy changes that occur between the neutralisation of a strong acid and a weak acid by sodium hydroxide. Explain the

differences seen.

Watch Video Solution

## Questions Miscellaneous

**1.** Calculate the enthalpy of combustion of acetic (1) when burnt in excess of $O_2$ in a bomb calorimeter. Given that $\Delta H_f^\circ, H_2O_{(l)} = -285.84 \text{ KJ mol}^{-1}$ and $\Delta_f H^\circ, CO_{2(g)} = -393.52$ K

.

Watch Video Solution

**2.** Heat of neutralisation of a strong acid is ___ than that of a weak acid.

Watch Video Solution

**3.** $\Delta H$ for the reaction at 298 K $CO(g) + 1/2O_2(g)$ is $282.85 KJmol^{-1}$. Calculate $\Delta U$ of the reaction.

Watch Video Solution

## Question

**1.** From the following data at constant volume for combustion of benzene, calculate the heat of this reaction at constant pressure condition.

$C_6H_{6(1)} + 71/2O_{2(g)} \rightarrow 6CO_{2(g)} + 13H_2O_{(l)}$

Watch Video Solution

**2.** Calculate the enthalpy of combustion of ethylene at 300K at constant pressure if its enthalpy of combustion at constant volume is $-1406\ \text{kJ mol}^{-1}$.

Watch Video Solution

**3.** (a) The measured heats of neutralization of acetic acid, formic acid, hydrocyanic acid, and hydrogen sulphide are 13.20, 13.40, 2.90 and 3.80 KCal per g.equiv. respectively. Arrange these acids in a decreasing order of strength.

(b) Heat of neutralization of formic acid by $NH_4OH$ is 11.9 KCal per g.equiv. What is the heat of ionization of $NH_4OH$?

View Text Solution

**4.** Which of the following is an exothermic reaction?

A. melting of ice

B. combustion reactions

C. hydrolysis

D. boiling of water

**Answer:**

Watch Video Solution

**5.** Which of the following is reversible process?

A. Diffusion

B. melting

C. neutralization

D. combustion

**Answer:**

Watch Video Solution

**6.** In which process, work is maximum?

A. reversible

B. irreversible

C. exothermic

D. cyclic

**Answer:**

Watch Video Solution

**7.** Translational energy of molecules is a part of _____energy of the system.

Watch Video Solution

**8.** Specific heat of a liquid system is _____property.

Watch Video Solution

**9.** Work done in the reversible expansion is

Watch Video Solution

**10.** Combustion is an_____ process.

Watch Video Solution

**11.** Heat of neutralisation of a strong acid is ___ than that of a weak acid.

Watch Video Solution

**12.** Name the equipment using which heat of combustion of compounds are determined?

Watch Video Solution

**13.** Energy can be created and be destroyed. State whether this is true or false.

Watch Video Solution

**14.** State Zeroth law of thermodynamic .

Watch Video Solution

**15.** Give the relation between $\Delta U$ and $\Delta H$.

Watch Video Solution

**16.** Define an adiabatic process.

Watch Video Solution

**17.** Write the differences between an exothermic and an endothermic process.

Watch Video Solution

**18.** What are intensive and extensive properties?.

Watch Video Solution

**19.** Define first law of thermodynamics.

Watch Video Solution

**20.** Explain thermal and mechanical equilibrium processes.

Watch Video Solution

**21.** Describe a bomb calorimeter and explain how heat of formation of an organic compound is determined.

Watch Video Solution

**22.** Compare the enthalpy changes that occur between the neutralisation of a strong acid and a weak acid by sodium hydroxide. Explain the differences seen.

Watch Video Solution

**23.** Calculate the enthalpy of combustion of acetic (1) when burnt in excess of $O_2$ in a bomb calorimeter. Given that $\Delta H_f^\circ, H_2O_{(l)} = -285.84 \text{ KJ mol}^{-1}$ and $\Delta_f H^\circ, CO_{2(g)} = -393.52$ K

.

Watch Video Solution

**24.** Heat of neutralisation of a weak acid HA by $NaOH$ is $-12.13 \text{ kJ mol}^{-1}$. Calculate the enthalpy of ionization of HA.

Watch Video Solution

**25.** $\Delta H$ for the reaction at 298 K $CO(g) + 1/2O_2(g)$ is $282.85 KJmol^{-1}$.

Calculate $\Delta U$ of the reaction.

Watch Video Solution

## Problem

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

View Text Solution

**2.** The standard enthalpies of formation of

$C_2H_5(OH)(I), CO_2(g)$ and $H_2O(l)$ are

$-277, -393.5$ and $-285.5$ kJ $mol^{-1}$ respectively.

Calculate the standard enthalpy change for the reaction

$C_2H_5OH(l) + 3O_2(g) \rightarrow 2CO_2(g) + 3H_2O(l)$

The enthalpy of formation of $O_2(g)$ in the standard state is Zero, by definition

View Text Solution

**3.** Calculate the value of $\Delta U$ and $\Delta H$ on heating 128.0 g of oxygen from $0^\circ C$ to $100^0 C$. $C_V$ and $C_P$ on an average are 21 and 29 $\text{J mol}^{-1}K^{-1}$. (The difference is 8 $\text{J mol}^{-1}K^{-1}$ which is approximately equal to R)

View Text Solution

**4.** Calculate the enthalpy of combustion of ethylene at 300 K at constant pressure, if its heat of combustion at constant volume $(\Delta U)$ is -1406 kJ.

View Text Solution

**5.** If an automobile engine burns petrol at a temperature of $816^{\circ} C$ and if the surrounding temperature is $21^{\circ} C$, calculate its maximum possible efficiency.

View Text Solution

**6.** Calculate the standard entropy change for the following reaction $\left(\Delta S_{f}^{0}\right)$, given the standard entropies of $CO_2(g), C(s), O_2(g)$ as $213.6$ , $5.740$ and $205\ \mathrm{JK}^{-1}$ respectively.

View Text Solution

**7.** Calculate the entropy change during the melting of one mole of ice into water at $0^{\circ} C$ and 1 atm pressure. Enthalpy of fusion of ice is $6008\ \ \mathrm{J\ mol}^{-1}$

View Text Solution

**8.** Show that the reaction $CO + \left(\frac{1}{2}\right)O_2 \rightarrow CO_2$ at 300K is spontaneous. The standard Gibbs free energies of formation of $CO_2$ and $CO$ are $-394.4$ and $-137.2kJ\ \text{mole}^{-1}$ respectively.

View Text Solution

**9.** Calculate $\Delta G^0$ for conversion of oxygen to ozone $3/2O_2 \Leftrightarrow O_{3(g)}$ at 298 K, if $K_p$ for this conversion is $2.47 \times 10^{-29}$ in standard pressure units.

View Text Solution

## Evaluate Yourself

**1.** Calculate $\Delta H_f^0$ for the reaction $CO_2(g) + H_2(g) \rightarrow CO(g) + H_2O(g)$ given that $\Delta H_f^0$ for $CO_2(g), CO(g)$ and $H_2O(g)$ are -393.5, -111.31 and -242 kJ $\text{mol}^{-1}$ respectively.

View Text Solution

**2.** Calculate the amount of heat necessary to raise 180 g of water from $25^0C$ to $100^0C$. Molar heat capacity of water is $75.3\ \text{J mol}^{-1}K^{-1}$

View Text Solution

**3.** From the following data at constant volume for combustion of benzene, calculate the heat of this reaction at constant pressure condition.

$$C_6H_6(l) + 7\frac{1}{2}O_2(g) \rightarrow 6CO_2(g) + 3H_2O(l)$$

$$\Delta U \text{ at } 25^0C = -3268.12KJ$$

View Text Solution

**4.** When a mole of magnesium bromide is prepared from 1 mole of magnesium and 1 mole of liquid bromine, 524 kJ of energy is released. The heat of sublimation of Mg metal is $148\ \text{kJ mol}^{-1}$. The heat of dissociation of bromine gas into atoms is $193\ \text{kJ mol}^{-1}$. The heat of

vapourisation of liquid bromine is $31 \ \text{kJ mol}^{-1}$. The ionisation energy of magnesium is $2187 \ \text{kJ mol}^{-1}$ and the electron affinity of bromine is $-662 \ \text{kJ mol}^{-1}$. Calculate the lattice energy of magnesium bromide.

View Text Solution

**5.** An engine operating between $127^0C$ and $47^0C$ takes some specified amount of heat from a high temperature reservoir. Assuming that there are no frictional losses, calculate the percentage efficiency of an engine.

View Text Solution

**6.** Urea on hydrolysis produces ammonia and carbon dioxide. The standard entropies of urea, $H_2O, CO_2, NH_3$ are $173.8, 70, 213.5$ and $192.5J \ \text{mole}^{-1}K^{-1}$ respectively. Calculate the entropy change for this reaction.

View Text Solution

**7.** Calculate the entropy change when 1 mole of ethanol is evaporated at 351 K. The molar heat of vaporisation of ethanol is $39.84 \ \text{kJ mol}^{-1}$

View Text Solution

**8.** For a chemical reaction the values of $\Delta H$ and $\Delta S$ at $300K$ are $-10 \ \text{kJ mole}^{-1}$ and $-20 \ \text{J deg}^{-1}\text{mole}^{-1}$ respectively. What is the value of $\Delta G$ of the reaction? Calculate the $\Delta G$ of a reaction at 600 K assuming $\Delta H$ and $\Delta S$ values are constant. Predict the nature of the reaction.

View Text Solution

## Evaluation Choose The Best Answer

**1.** The amount of heat exchanged with the surrounding at constant temperature and pressure is given by the quantity

A. $\Delta E$

B. $\Delta H$

C. $\Delta S$

D. $\Delta G$

**Answer: B**

View Text Solution

**2.** All the naturally occurring processes proceed spontaneously in a direction which leads to

A. decrease in entropy

B. increase in enthalpy

C. increase in free energy

D. decrease in free energy

**Answer: D**

View Text Solution

**3.** In an adiabatic process, which of the following is true ?

A. $q = w$

B. $q = 0$

C. $\Delta E = q$

D. $P\Delta V = 0$

**Answer: B**

View Text Solution

**4.** In a reversible process, the change in entropy of the universe is

A. $> 0$

B. $\geq 0$

C. $< 0$

D. $d = 0$

**Answer: D**

View Text Solution

**5.** In an adiabatic expansion of an ideal gas

A. $w = -\Delta u$

B. $w = \Delta u + \Delta H$

C. $\Delta u = 0$

D. $w = 0$

**Answer: A**

View Text Solution

**6.** The intensive property among the quantities below is

A. mass

B. volume

C. enthalpy

D. $\frac{\text{mass}}{\text{volume}}$

**Answer: D**

View Text Solution

**7.** An ideal gas expands from the volume of $1 \times 10^{-3} m^3$ to $1 \times 10^{-2} m^3$ at 300 K against a constant pressure at $1 \times 10^5 Nm^{-2}$. The work done is

A. $-900J$

B. $900kJ$

C. $270kJ$

D. $-900kJ$

**Answer: A**

View Text Solution

**8.** Heat of combustion is always

A. positive

B. negative

C. zero

D. either positive or negative

**Answer: B**

View Text Solution

**9.** The heat of formation of $CO$ and $CO_2$ are – 26.4 kCal and – 94 kCal, respectively. Heat of combustion of carbon monoxide will be

A. $+26.4kcal$

B. $-67.6kcal$

C. $-120.6kcal$

D. $+52.8kcal$

**Answer: B**

View Text Solution

**10.** C(diamond) $\rightarrow$ C(graphite), $\Delta H = -ve$, this indicates that

A. graphite is more stable than diamond

B. graphite has more energy than diamond

C. both are equally stable

D. stability cannot be predicted

**Answer: A**

View Text Solution

**11.** The enthalpies of formation of $Al_2O_3$ and $Cr_2O_3$ are - 1596 kJ and -1134 kJ, respectively.

$\Delta H$ for the reaction $2Al + Cr_2O_3 \rightarrow 2Cr + Al_2O_3$ is

A. $-1365kJ$

B. 2730 kJ

C. $-2730kJ$

D. $-462kJ$

**Answer: D**

View Text Solution

**12.** Which of the following is not a thermodynamic function ?

A. internal energy

B. enthalpy

C. entropy

D. frictional energy

**Answer: D**

View Text Solution

**13.** If one mole of ammonia and one mole of hydrogen chloride are mixed in a closed container to form ammonium chloride gas, then

A. $\Delta H > \Delta U$

B. $\Delta H - \Delta U = 0$

C. $\Delta H + \Delta U = 0$

D. $\Delta H < \Delta U$

**Answer: D**

View Text Solution

**14.** Change in internal energy, when 4 kJ of work is done on the system and 1 kJ of heat is given out by the system is

A. $+1kJ$

B. $-5kJ$

C. $+3kJ$

D. $-3kJ$

**Answer: C**

View Text Solution

**15.** The work done by the liberated gas when 55.85 g of iron (molar mass $55.85 \ \ \mathrm{g\ mol^{-1}}$) reacts with hydrochloric acid in an open beaker at $25^0C$

A. $-2.48kJ$

B. $-2.22kJ$

C. $+2.22kJ$

D. $+2.48kJ$

**Answer: A**

View Text Solution

**16.** The value of $\Delta H$ for cooling 2 moles of an ideal monatomic gas from $125^0C$ to $25^0C$ at constant pressure will be $\left[\text{given } C_P = \frac{5}{2}R\right]$

A. $-250R$

B. $-500R$

C. 500 R

D. $+250R$

**Answer: B**

View Text Solution

**17.** Given that $C(g) + O_2(g) \rightarrow CO_2(g) \Delta H^0 = -akJ, 2CO(g) \rightarrow 2CO_2(g) \Delta H^0 = -$

Cal- culate the $\Delta H^0$ for the reaction $C(g) + \frac{1}{2}O_2(g) \rightarrow CO(g)$

A. $\frac{b+2a}{2}$

B. $2a - b$

C. $\frac{2a-b}{2}$

D. $\frac{b-2a}{2}$

**Answer: D**

View Text Solution

**18.** When 15.68 litres of a gas mixture of methane and propane are fully combusted at $0^0C$ and 1 atmosphere, 32 litres of oxygen at the same temperature and pressure are consumed. The amount of heat of released from this combustion in kJ is $\left(\Delta H_C(CH_4) = -890 \text{ kJ mol}^{-1} \text{ and } \Delta H_C(C_3H_8) = -2220 \text{ kJ mol}^{-1}\right.$

A. $-889kJ$

B. $-1390kJ$

C. $-3180kJ$

D. $-653.66kJ$

**Answer: D**

View Text Solution

**19.** The bond dissociation energy of methane and ethane are $360\ \text{kJ mol}^{-1}$ and $620\ \text{kJ mol}^{-1}$ respectively. Then, the bond dissociation energy of C-C bond is

A. $170\ \text{kJ mol}^{-1}$

B. $50\ \text{kJ mol}^{-1}$

C. $80\ \text{kJ mol}^{-1}$

D. $220\ \text{kJ mol}^{-1}$

**Answer: C**

View Text Solution

**20.** The correct thermodynamic conditions for the spontaneous reaction at all temperature is (NEET Phase - I)

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

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

C. $\Delta H > 0$ and $\Delta S = 0$

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

**Answer: A**

View Text Solution

**21.** The temperature of the system, decreases in an _____

A. Isothermal expansion

B. Isothermal Compression

C. adiabatic expansion

D. adiabatic compression

**Answer: C**

View Text Solution

**22.** In an isothermal reversible compression of an ideal gas the sign of $q$, $\Delta S$ and w are respectively

A. $+, -, -$

B. $-, +, -$

C. $+, -, +$

D. $-, -, +$

**Answer: D**

View Text Solution

**23.** Molar heat of vapourisation of a liquid is $4.8\ \text{kJ mol}^{-1}$. If the entropy change is $16\ \text{J mol}^{-1}K^{-1}$, the boiling point of the liquid is

A. $323K$

B. $27^0C$

C. 164 K

D. 0.3 K

**Answer: B**

View Text Solution

**24.** $\Delta S$ is expected to be maximum for the reaction

A. $Ca(S) + \frac{1}{2}O_2(g) \rightarrow CaO(S)$

B. $C(S) + O_2(g) \rightarrow CO_2(g)$

C. $N_2(g) + O_2(g) \rightarrow 2NO(g)$

D. $CaCO_3(S) \rightarrow CaO(S) + CO_2(g)$

**Answer: D**

View Text Solution

**25.** The values of $\Delta H$ and $\Delta S$ for a reaction are respectively $30\ \text{kJ mol}^{-1}$ and $100 JK^{-1}\ \text{mol}^{-1}$. Then the temperature above which the reaction will become spontaneous is

A. 300 K

B. 30 K

C. 100 K

D. $20^0 C$

**Answer: A**

View Text Solution

## Evaluation

**1.** Calculate the work done when 2 moles of an ideal gas expands reversibly and isothermally from a volume of 500 ml to a volume of 2 L at $25^{\circ} C$ and normal pressure.

View Text Solution

**2.** In a constant volume calorimeter, 3.5 g of a gas with molecular weight 28 was burnt in excess oxygen at 298 K. The temperature of the calorimeter was found to increase from 298 K to 298.45 K due to the combustion process. Given that the calorimeter constant is $2.5 kJ K^{-1}$. Calculate the enthalpy of combustion of the gas in $kJ \ \ \mathrm{mol}^{-1}$.

View Text Solution

**3.** Calculate the entropy change in the system, and surroundings, and the total entropy change in the universe during a process in which 245 J of heat flow out of the system at $77^{\circ} C$ to the surrounding at $33^{\circ} C$.

View Text Solution

**4.** 1 mole of an ideal gas, maintained at 4.1 atm and at a certain temperature, absorbs heat 3710J and expands to 2 litres. Calculate the entropy change in expansion process.

View Text Solution

**5.** 30.4 kJ is required to melt one mole of sodium chloride. The entropy change during melting is $28.4 JK^{-1} \ \ \mathrm{mol}^{-1}$. Calculate the melting point of sodium chloride.

View Text Solution

**6.** Calculate the standard heat of formation of propane, if its heat of combustion is $-2220.2\ \text{kJ mol}^{-1}$. the heats of formation of $CO_2(g)$ and $H_2O(l)$ are $-393.5$ and $-285.8\ \text{kJ mol}^{-1}$ respectively.

View Text Solution

**7.** You are given normal boiling points and standard enthalpies of vapourisation. Calculate the entropy of vapourisation of liquids listed below.

| S. No | Liquid | Boiling points ($^0$C) | $\Delta H$ ( kJ $mol^{-1}$) |
|---|---|---|---|
| 1. | Ethanol | 78.4 | + 42.4 |
| 2. | Toluene | 110.6 | + 35.2 |

View Text Solution

**8.** For the reaction $Ag_2O(S) \rightarrow 2Ag(s) + \frac{1}{2}O_2(g) : \Delta H = 30.56 \text{ kJ mol}^{-1}$ and $\Delta S = 6.66J$ (at 1 atm). Calculate the temperature at which $\Delta G$ is equal to zero. Also predict the direction of the reaction (i) at this temperature and (ii) below this temperature.

View Text Solution

**9.** What is the equilibrium constant Keq for the following reaction at 400K

$2NOCl(g) \Leftrightarrow 2NO(g) + Cl_2(g)$,

given that $\Delta H^0 = 77.2 \text{ kJ mol}^{-1}$, and $\Delta S^0 = 122JK^{-1} \text{ mol}^{-1}$.

View Text Solution

**10.** Cyanamide $(NH_2CN)$ is completely burnt in excess oxygen in a bomb calorimeter, $\Delta U$ was found to be $-742.4 \text{ kJ mol}^{-1}$, calculate the

enthalpy change of the reaction at $298K$. $NH_2CN(s) + \frac{3}{2}O_2(g) \rightarrow N_2(g) + CO_2(g) + H_2O(l)\Delta H = ?$

View Text Solution

**11.** Calculate the enthalpy of hydrogenation of ethylene from the following data. Bond energies of C $-H, C-C, C=C$ and $H-H$ are $414, 347, 618$ and $435kJmol-1$.

View Text Solution

**12.** Calculate the lattice energy of $CaCl_2$ from the given data

$Ca(s) + Cl_2(g) \rightarrow CaCl_2(s)\Delta H_f^0 = -795 \text{ kJ mol}^{-1}$

$\text{Atomisation} : Ca(s) \rightarrow Ca(g) \quad \Delta_1^0 = +121 \text{ kJ mol}^{-1}$

$\text{Ionisation} : Ca(g) \rightarrow Ca^{2+}(g) + 2e^- \quad \Delta H_2^0 = +2422 \text{ kJ mol}^{-}$

$\text{Dissociation} : Cl_2(g) \rightarrow 2Cl(g) \quad \Delta H_3^0 = +242.8 \text{ kJ mol}^{-1}$

$\text{Electron affinity} : Cl(g) + e^- \rightarrow Cl^-(g) \quad \Delta H_4^0 = -355 \text{ kJ mol}^{-1}$

View Text Solution

**13.** Calculate the enthalpy change for the reaction $Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$ from the following data.

$2Fe + \frac{3}{2}O_2 \rightarrow fe_2O_3, \Delta H = -741kJ$

$C + \frac{1}{2}O_2 \rightarrow CO, \Delta H = -137kJ$

$C + O_2 \rightarrow CO_2, \Delta H = -394.5kJ$

View Text Solution

**14.** When 1-pentyne (A) is treated with 4N alcoholic KOH at $175^\circ C$, it is converted slowly into an equilibrium mixture of 1.3% 1-pentyne(A) , 95.2% 2-pentyne(B) and 3.5% of 1,2 pentadiene (C) the equilibrium was maintained at $175^\circ C$, calculate $\Delta G_0$ for the following equilibria.

$B \Leftrightarrow A \quad \Delta G_1^0 = ?$

$B \Leftrightarrow C \quad \Delta G_2^0 = ?$

View Text Solution

**15.** At $33K$, $N_2O_4$ is fifty percent dissociated. Calculate the standard free energy change at this temperature and at one atmosphere.

View Text Solution

**16.** The standard enthalpies of formation of $SO_2$ and $SO_3$ are $-297 \text{ kJ mol}^{-1}$ and $-396 \text{ kJ mol}^{-1}$ respectively. Calculate the standard enthalpy of reaction for the reaction: $SO_2 + \frac{1}{2}O_2 \rightarrow SO_3$

View Text Solution

**17.** For the reaction at 298 K : $2A + B \rightarrow C$

$\Delta H = 400 \text{ J mol}^{-1}, \Delta S = 0.2JK^{-1} \text{ mol}^{-1}$ Determine the temperature at which the reaction would be spontaneous.

View Text Solution

**18.** Find out the value of equilibrium constant for the following reaction at $298K, 2NH_3(g) + CO_2(g) \Leftrightarrow NH_2CONH_2(aq) + H_2O(l)$ Standard Gibbs energy change, $\Delta G_r^0$ at the given temperature is $-13.6 \text{ kJ mol}^{-1}$.

View Text Solution

View Text Solution

**19.** A gas mixture of 3.67 lit of ethylene and methane on complete combustion at $25^{\circ}C$ and at 1 atm pressure produce 6.11 lit of carbondioxide. Find out the amount of heat evolved in kJ, during this combustion.

$\left(\Delta H_C(CH_4) = -890 \text{ kJ mol}^{-1} \text{ and } \left(\Delta H_C(C_2H_4) = -1423 \text{ kJ mol}^{-}\right.\right.$

View Text Solution