PrepWiser.

CHEMISTRY · JEE MAIN

Chemical Thermodynamics

Chapter-wise previous year questions, with answer key

104	2020–2025	7
PYQS	PAPERS	TOPICS

Enthalpy and Heat Capacity · Hess's Law · First Law and Internal Energy · Gibbs Free Energy · Entropy and Spontaneity · Bond Enthalpy · Lattice Energy and Born-Haber Cycle

1. Attempt each question on paper first — they're grouped by topic, newest papers first.
2. Check yourself against the answer key at the end.
3. Got one wrong? Tap “Step-by-step solution” under it for the full working.

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Enthalpy and Heat Capacity · 34 PYQs

Q1 JEE Main 2025 · 4 Apr · Shift 2

Consider the given data :

(a) $\mathrm{HCl(g) + 10H_2O(l) \rightarrow HCl.10H_2O \Delta H = -69.01 kJ mol^{-1}}$

(b) $\mathrm{HCl(g) + 40H_2O(l) \rightarrow HCl.40H_2O \Delta H = -72.79 kJ mol^{-1}}$

Choose the correct statement :

(A) The heat of dilution for the $\mathrm{HCl\,(HCl.10H_2O}$ to $\mathrm{HCl.40H_2O)}$ is $3.78 \mathrm{kJ mol^{-1}}$.

(B) Dissolution of gas in water is an endothermic process.

(C) The heat of solution depends on the amount of solvent.

(D) The heat of formation of HCl solution is represented by both (a) and (b).

Step-by-step solution ▸ prepwiser.in/questions/eUDWFwyaax

Q2 JEE Main 2025 · 3 Apr · Shift 2

Given below are two statements:

Statement I : When a system containing ice in equilibrium with water (liquid) is heated, heat is absorbed by the system and there is no change in the temperature of the system until whole ice gets melted.

Statement II : At melting point of ice, there is absorption of heat in order to overcome intermolecular forces of attraction within the molecules of water in ice and kinetic energy of molecules is not increased at melting point.

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

(A) Both Statement I and Statement II are false

(B) Statement I is true but Statement II is false

(C) Both Statement I and Statement II are true

(D) Statement I is false but Statement II is true

Step-by-step solution ▸ prepwiser.in/questions/mpBJBHzkBH

Q3 JEE Main 2025 · 3 Apr · Shift 2

A sample of n -octane $(1.14 \mathrm{g})$ was completely burnt in excess of oxygen in a bomb calorimeter, whose heat capacity is $5 \mathrm{kJ K^{-1}}$. As a result of combustion reaction, the temperature of the calorimeter is increased by 5 K . The magnitude of the heat of combustion of octane at constant volume is_____ $\mathrm{kJ mol^{-1}}$ (nearest integer).

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/fxl8OTXw9i

Q4 JEE Main 2024 · 9 Apr · Shift 1

When equal volume of $1 \mathrm{M HCl}$ and $1 \mathrm{M H_2SO_4}$ are separately neutralised by excess volume of $1 \mathrm{M\ NaOH}$ solution. x and $y \mathrm{kJ}$ of heat is liberated respectively. The value of y/x is _____.

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/vNFTOVYJ8N

Q5 JEE Main 2024 · 8 Apr · Shift 2

$\Delta_{vap}H^{\ominus}$ for water is $+40.79 kJ mol^{-1}$ at 1 bar and $100^{\circ}C$. Change in internal energy for this vapourisation under same condition is _____ $kJ mol^{-1}$. (Integer answer) (Given $R = 8.3 JK^{-1} mol^{-1}$)

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/qKdnBpKNKm

Q6 JEE Main 2024 · 5 Apr · Shift 1

Given below are two statements: One is labelled as Assertion (A) and the other is labelled as Reason (R)

Assertion (A) : Enthalpy of neutralisation of strong monobasic acid with strong monoacidic base is always $-57 kJ mol^{-1}$

Reason (R) : Enthalpy of neutralisation is the amount of heat liberated when one mole of H^+ ions furnished by acid combine with one mole of ^-OH ions furnished by base to form one mole of water.

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

(A) (A) is true but (R) is false

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

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

(D) (A) is false but (R) is true

Step-by-step solution ▸ prepwiser.in/questions/LUMK4jIn-C

Q7 JEE Main 2024 · 29 Jan · Shift 2

Standard enthalpy of vapourisation for CCl_4 is $30.5 kJ mol^{-1}$. Heat required for vapourisation of $284 g$ of CCl_4 at constant temperature is _____ kJ.

(Given molar mass in $g mol^{-1}$; $C = 12, Cl = 35.5$)

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/Zl-H6EuIff

Q8 JEE Main 2023 · 11 Apr · Shift 1

Solid fuel used in rocket is a mixture of Fe_2O_3 and Al (in ratio 1 : 2). The heat evolved (kJ) per gram of the mixture is _____. (Nearest integer)

Given:

$$\Delta H_f^{\theta}(Al_2O_3) = -1700 kJ mol^{-1}$$

$$\Delta H_f^{\theta}(Fe_2O_3) = -840 kJ mol^{-1}$$

Molar mass of Fe, Al and O are 56, 27 and 16 g mol^{-1} respectively.

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/ErFhUGFynS

Q9 JEE Main 2023 · 10 Apr · Shift 2

The number of endothermic process/es from the following is _____.

A. $\mathrm{I_2(g) \rightarrow 2I(g)}$

B.

$$\mathrm{HCl(g) \rightarrow H(g) + Cl(g)}$$

C.

$$\mathrm{H_2O(l) \rightarrow H_2O(g)}$$

D.

$$\mathrm{C(s) + O_2(g) \rightarrow CO_2(g)}$$

E. Dissolution of ammonium chloride in water

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/uHQhm9mHl0

Q10 JEE Main 2023 · 8 Apr · Shift 1

When a $60\mathrm{W}$ electric heater is immersed in a gas for 100 s in a constant volume container with adiabatic walls, the temperature of the gas rises by $5^{\circ}\mathrm{C}$. The heat capacity of the given gas is _____ $\mathrm{JK^{-1}}$ (Nearest integer)

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/yAcHceC_Mi

Q11 JEE Main 2023 · 1 Feb · Shift 1

At $25^{\circ}\mathrm{C}$, the enthalpy of the following processes are given :

$\mathrm{H_2(g) + O_2(g)}$	$\rightarrow$	$\mathrm{2OH(g)}$	$\Delta \mathrm{H^{\circ}} = 78\mathrm{kJmol^{-1}}$
$\mathrm{H_2(g) + \frac{1}{2}O_2(g)}$	$\rightarrow$	$\mathrm{H_2O(g)}$	$\Delta \mathrm{H^{\circ}} = -242\mathrm{kJmol^{-1}}$
$\mathrm{H_2(g)}$	$\rightarrow$	$\mathrm{2H(g)}$	$\Delta \mathrm{H^{\circ}} = 436\mathrm{kJmol^{-1}}$
$\mathrm{\frac{1}{2}O_2(g)}$	$\rightarrow$	$\mathrm{O(g)}$	$\Delta \mathrm{H^{\circ}} = 249\mathrm{kJmol^{-1}}$

What would be the value of X for the following reaction ? _____ (Nearest integer)

$\mathrm{H_2O(g) \rightarrow H(g) + OH(g) \Delta H^{\circ} = XkJmol^{-1}}$

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/jIMrwp3HHq

Q12 JEE Main 2023 · 1 Feb · Shift 2

$0.3\mathrm{g}$ of ethane undergoes combustion at $27^{\circ}\mathrm{C}$ in a bomb calorimeter. The temperature of calorimeter system (including the water) is found to rise by $0.5^{\circ}\mathrm{C}$. The heat evolved during combustion of ethane at constant pressure is _____ $\mathrm{kJmol^{-1}}$. (Nearest integer)

[Given : The heat capacity of the calorimeter system is

$$20\mathrm{kJK^{-1}}, \mathrm{R} = 8.3\mathrm{JK^{-1}mol^{-1}}$$

.

Assume ideal gas behaviour.

Atomic mass of C and H are 12 and $1\mathrm{gmol^{-1}}$ respectively]

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/Kk4YdVtGwp

Q13 JEE Main 2023 · 31 Jan · Shift 2

Enthalpies of formation of $\mathrm{CCl_4(g)}, \mathrm{H_2O(g)}, \mathrm{CO_2(g)}$ and $\mathrm{HCl(g)}$ are $-105, -242, -394$ and $-92\mathrm{kJ\ mol^{-1}}$ respectively. The magnitude of enthalpy of the reaction given below is _____ $\mathrm{kJmol^{-1}}$. (nearest integer)

$$\mathrm{CCl_4(g) + 2H_2O(g) \rightarrow CO_2(g) + 4HCl(g)}$$

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/nAcvb_L2CU

Q14 JEE Main 2023 · 31 Jan · Shift 1

The enthalpy change for the conversion of $\frac{1}{2}\mathrm{Cl_2(g)}$ to $\mathrm{Cl^-(aq)}$ is $(-)$ _____ $\mathrm{kJmol^{-1}}$ (Nearest integer)

Given :

$$\Delta_{\mathrm{dis}}\mathrm{H}^{\ominus}_{\mathrm{Cl}^{\theta}_{2(g)}} = 240\mathrm{kJmol^{-1}}, \Delta_{\mathrm{eg}}\mathrm{H}^{\ominus}_{\mathrm{Cl}_{(g)}} = -350\mathrm{kJmol^{-1}}$$

,

$\Delta_{\mathrm{hyd}}H^{\Theta}_{Cl^-_{(g)}} = -380\ \mathrm{kJmol^{-1}}$

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/gr1zBZIZno

Q15 JEE Main 2023 · 25 Jan · Shift 1

An athlete is given 100 g of glucose ($C_6H_{12}O_6$) for energy. This is equivalent to 1800kJ of energy. The 50% of this energy gained is utilized by the athlete for sports activities at the event. In order to avoid storage of energy, the weight of extra water he would need to perspire is _____ g (Nearest integer)

Assume that there is no other way of consuming stored energy.

Given : The enthalpy of evaporation of water is 45 kJ $\mathrm{mol^{-1}}$

Molar mass of C, H & O are 12, 1 and 16 g $\mathrm{mol^{-1}}$.

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/tfEmFXANDM

Q16 JEE Main 2022 · 29 Jul · Shift 2

$$\mathrm{C(s)} + \mathrm{O_2(g)} \rightarrow \mathrm{CO_2(g)} + 400\mathrm{kJ}$$
$$\mathrm{C(s)} + \frac{1}{2}\mathrm{O_2(g)} \rightarrow \mathrm{CO(g)} + 100\mathrm{kJ}$$

When coal of purity 60% is allowed to burn in presence of insufficient oxygen, 60% of carbon is converted into 'CO' and the remaining is converted into '$\mathrm{CO_2}$'. The heat generated when $0.6\mathrm{kg}$ of coal is burnt is _____.

(A) 1600 kJ

(B) 3200 kJ

(C) 4400 kJ

(D) 6600 kJ

Step-by-step solution ▸ prepwiser.in/questions/kDRI-qKcNf

Q17 JEE Main 2022 · 27 Jul · Shift 2

A gas (Molar mass = 280 $\mathrm{gmol^{-1}}$) was burnt in excess $\mathrm{O_2}$ in a constant volume calorimeter and during combustion the temperature of calorimeter increased from $298.0\mathrm{K}$ to $298.45\ \mathrm{K}$. If the heat capacity of calorimeter is $2.5\mathrm{kJK^{-1}}$ and enthalpy of combustion of gas is $9\mathrm{kJmol^{-1}}$ then amount of gas burnt is _____ g. (Nearest Integer)

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/xjNr0FIyRF

Q18 JEE Main 2022 · 27 Jul · Shift 1

The molar heat capacity for an ideal gas at constant pressure is $20.785\mathrm{JK^{-1}mol^{-1}}$. The change in internal energy is $5000\mathrm{J}$ upon heating it from $300\mathrm{K}$ to $500\mathrm{K}$. The number of moles of the gas at constant volume is _____. [Nearest integer] (Given: $\mathrm{R} = 8.314\mathrm{JK^{-1}mol^{-1}}$)

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/B9UKbp1aAW

Q19 JEE Main 2022 · 26 Jul · Shift 2

For the reaction

$$\mathrm{H_2F_2(g)} \rightarrow \mathrm{H_2(g)} + \mathrm{F_2(g)}$$

$\Delta U = -59.6\mathrm{kJmol^{-1}}$ at $27^{\circ}\mathrm{C}$.

The enthalpy change for the above reaction is $(-)$ _____ $\mathrm{kJ\,mol^{-1}}$ [nearest integer]

Given: $\mathrm{R} = 8.314\mathrm{JK^{-1}mol^{-1}}$.

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/d5ZdFu76Xh

Q20 JEE Main 2022 · 26 Jul · Shift 1

$2.4\mathrm{g}$ coal is burnt in a bomb calorimeter in excess of oxygen at $298\mathrm{K}$ and $1\mathrm{atm}$ pressure. The temperature of the calorimeter rises from $298\mathrm{K}$ to $300\mathrm{K}$. The enthalpy change during the combustion of coal is $-x\mathrm{kJmol^{-1}}$. The value of x is _____. (Nearest Integer)

(Given : Heat capacity of bomb calorimeter $20.0\mathrm{kJK^{-1}}$. Assume coal to be pure carbon)

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/c-k9JV0dTG

Q21 JEE Main 2022 · 29 Jun · Shift 1

17.0 g of NH_3 completely vapourises at $-33.42^{\circ}C$ and 1 bar pressure and the enthalpy change in the process is 23.4 kJ mol^{-1}. The enthalpy change for the vapourisation of 85 g of NH_3 under the same conditions is _____ kJ.

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/XZVZFS7Wum

Q22 JEE Main 2022 · 28 Jun · Shift 2

For combustion of one mole of magnesium in an open container at 300 K and 1 bar pressure, $\Delta_C H^{\Theta} = -601.70$ kJ mol^{-1}, the magnitude of change in internal energy for the reaction is _____ kJ. (Nearest integer)

(Given : R = 8.3 J K^{-1} mol^{-1})

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/e4jE-5yH4t

Q23 JEE Main 2022 · 26 Jun · Shift 1

For complete combustion of methanol

$CH_3OH(I) + \frac{3}{2}O_2(g) \rightarrow CO_2(g) + 2H_2O(I)$

the amount of heat produced as measured by bomb calorimeter is 726 kJ mol^{-1} at $27^{\circ}C$. The enthalpy of combustion for the reaction is $-x$ kJ mol^{-1}, where x is _____. (Nearest integer)

(Given : R = 8.3 JK^{-1} mol^{-1})

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/kaddSod9uZ

Q24 JEE Main 2022 · 26 Jun · Shift 2

A fish swimming in water body when taken out from the water body is covered with a film of water of weight 36 g. When it is subjected to cooking at $100^{\circ}C$, then the internal energy for vaporization in kJ mol^{-1} is _____. [nearest integer]

[Assume steam to be an ideal gas. Given $\Delta_{vap}H^{\Theta}$ for water at 373 K and 1 bar is 41.1 kJ mol^{-1} ; R = 8.31 J K^{-1} mol^{-1}]

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/T_o813BSA5

Q25 JEE Main 2022 · 24 Jun · Shift 2

At 25°C and 1 atm pressure, the enthalpies of combustion are as given below :

Substance	H_2	C (graphite)	$C_2H_6(g)$
$\frac{\Delta_c H^\ominus}{kJ\ mol^{-1}}$	-286.0	-394.0	-1560.0

The enthalpy of formation of ethane is

(A) +54.0 kJ mol^{-1}

(B) -68.0 kJ mol^{-1}

(C) -86.0 kJ mol^{-1}

(D) +97.0 kJ mol^{-1}

Step-by-step solution ▸ prepwiser.in/questions/-VU8mo14-p

Q26 JEE Main 2021 · 27 Aug · Shift 1

200 mL of 0.2 M HCl is mixed with 300 mL of 0.1 M NaOH. The molar heat of neutralization of this reaction is -57.1 kJ. The increase in temperature in °C of the system on mixing is x $\times$ 10^{-2}. The value of x is _____. (Nearest integer)

[Given : Specific heat of water = 4.18 J g^{-1} K^{-1}, Density of water = 1.00 g cm^{-3}]

[Assume no volume change on mixing)

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/N-wLIfwDfS

Q27 JEE Main 2021 · 26 Aug · Shift 2

For water Δ_{vap} H = 41 kJ mol^{-1} at 373 K and 1 bar pressure. Assuming that water vapour is an ideal gas that occupies a much larger volume than liquid water, the internal energy change during evaporation of water is _____ kJ mol^{-1}

[Use : R = 8.3 J mol^{-1} K^{-1}]

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/pbWiZMoRiY

Q28 JEE Main 2021 · 27 Jul · Shift 1

For water at 100° C and 1 bar,

Δ_{vap} H $-$ Δ_{vap} U = _____ $\times$ 10^2 J mol^{-1}. (Round off to the Nearest Integer)

[Use : R = 8.31 J mol^{-1} K^{-1}]

[Assume volume of $H_2O(l)$ is much smaller than volume of $H_2O(g)$. Assume $H_2O(g)$ treated as an ideal gas]

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/o39RMdMgxt

Q29 JEE Main 2021 · 27 Jul · Shift 2

When 400 mL of 0.2 M H_2SO_4 solution is mixed with 600 mL of 0.1 M NaOH solution, the increase in temperature of the final solution is _____ $\times 10^{-2}$ K. (Round off to the nearest integer).

[Use : H^+ (aq) + OH^- (aq) $\rightarrow$ H_2O : $\Delta_\gamma H = -57.1$ kJ mol^{-1}]

Specific heat of H_2O = 4.18 J K^{-1} g^{-1}

density of H_2O = 1.0 g cm^{-3}

Assume no change in volume of solution on mixing.

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/p2gc2ZSj3B

Q30 JEE Main 2021 · 25 Jul · Shift 1

At 298 K, the enthalpy of fusion of a solid (X) is 2.8 kJ mol^{-1} and the enthalpy of vaporisation of the liquid (X) is 98.2 kJ mol^{-1}. The enthalpy of sublimation of the substance (X) in kJ mol^{-1} is _____. (in nearest integer)

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/zzReU9yCwX

Q31 JEE Main 2021 · 22 Jul · Shift 2

If the standard molar enthalpy change for combustion of graphite powder is -2.48×10^2 kJ mol^{-1}, the amount of heat generated on combustion of 1 g of graphite powder is _____ kJ. (Nearest integer)

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/x-WebljQBn

Q32 JEE Main 2021 · 25 Feb · Shift 1

The reaction of cyanamide, $NH_2CN_{(s)}$ with oxygen was run in a bomb calorimeter and ΔU was found to be -742.24 kJ mol^{-1}. The magnitude of ΔH_{298} for the reaction

$$NH_2CH_{(S)} + \frac{3}{2}O_{2(g)} \rightarrow N_{2(g)} + O_{2(g)} + H_2O_{(I)}$$

is _____ kJ. (Rounded off to the nearest integer) [Assume ideal gases and R = 8.314 J mol^{-1} K^{-1}]

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/i3LIj5x9Fr

Q33 JEE Main 2020 · 4 Sep · Shift 2

The process that is NOT endothermic in nature is :

(A) $Ar(g) + e^- \rightarrow Ar^-(g)$

(B) $H(g) + e^- \rightarrow H^-(g)$

(C) $Na(g) \rightarrow Na^+(g) + e^-$

(D) $O^-(g) + e^- \rightarrow O^{2-}(g)$

Step-by-step solution ▸ prepwiser.in/questions/74mi7bGJYq

Q34 JEE Main 2020 · 2 Sep · Shift 2

The heat of combustion of ethanol into carbon dioxide and water is – 327 kcal at constant pressure. The heat evolved (in cal) at constant volume and 27°C (if all gases behave ideally) is (R = 2 cal mol^{-1} K^{-1}) _____.

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/uXueWKLWaT

Hess's Law · 13 PYQs

Q35 JEE Main 2025 · 29 Jan · Shift 2

If C (diamond) $\rightarrow C$ (graphite) $+X\,\mathrm{kJ\,mol^{-1}}$

C (diamond) $+\mathrm{O_2(g)} \rightarrow \mathrm{CO_2(g)} + \mathrm{Y\,kJ\,mol^{-1}}$

C (graphite) $+\mathrm{O_2(g)} \rightarrow \mathrm{CO_2(g)} + \mathrm{Z\,kJ\,mol^{-1}}$

at constant temperature. Then

(A) −X = Y + Z

(B) X = Y − Z

(C) X = −Y + Z

(D) X = Y + Z

Step-by-step solution ▸ prepwiser.in/questions/vNN7tOTuIc

Q36 JEE Main 2025 · 28 Jan · Shift 2

Consider the following data :

Heat of formation of $\mathrm{CO_2(g)} = -393.5\,\mathrm{kJ\,mol^{-1}}$

Heat of formation of $\mathrm{H_2O(l)} = -286.0\,\mathrm{kJ\,mol^{-1}}$

Heat of combustion of benzene $= -3267.0\,\mathrm{kJ\,mol^{-1}}$

The heat of formation of benzene is _____ $\mathrm{kJ\,mol^{-1}}$. (Nearest integer)

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/eaa_6RT_1z

Q37 JEE Main 2025 · 24 Jan · Shift 2

$$\mathrm{S(g)} + \frac{3}{2}\mathrm{O_2(g)} \rightarrow \mathrm{SO_3(g)} + 2x\mathrm{kcal}$$
$$\mathrm{SO_2(g)} + \frac{1}{2}\mathrm{O_2(g)} \rightarrow \mathrm{SO_3(g)} + y\mathrm{kcal}$$

The heat of formation of $\mathrm{SO_2(g)}$ is given by :

(A) $2x + y$ kcal

(B) $\frac{2x}{y}\mathrm{kcal}$

(C) $y - 2x\mathrm{kcal}$

(D) $x + y\mathrm{kcal}$

Step-by-step solution ▸ prepwiser.in/questions/-nzctaFEzp

Q38 JEE Main 2025 · 22 Jan · Shift 2

Consider the following cases of standard enthalpy of reaction ($\Delta \mathrm{H_r^\circ}$ in $\mathrm{kJmol^{-1}}$)

$$\mathrm{C_2H_6(g)} + \frac{7}{2}\mathrm{O_2(g)} \rightarrow 2\mathrm{CO_2(g)} + 3\mathrm{H_2O(l)} \Delta \mathrm{H_1^\circ} = -1550$$
$$\mathrm{C(\ graphite\ )} + \mathrm{O_2(g)} \rightarrow \mathrm{CO_2(g)} \Delta \mathrm{H_2^\circ} = -393.5$$
$$\mathrm{H_2(g)} + \frac{1}{2}\mathrm{O_2(g)} \rightarrow \mathrm{H_2O(l)} \Delta \mathrm{H_3^\circ} = -286$$

The magnitude of $\Delta \mathrm{H}^\circ_{f\mathrm{C_2H_6(g)}}$ is _____ $\mathrm{kJmol^{-1}}$ (Nearest integer).

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/Cw3VmOJHZ-

Q39 JEE Main 2024 · 9 Apr · Shift 1

The heat of solution of anhydrous $\mathrm{CuSO_4}$ and $\mathrm{CuSO_4 \cdot 5H_2O}$ are $-70\mathrm{kJmol^{-1}}$ and $+12\mathrm{kJmol^{-1}}$ respectively. The heat of hydration of $\mathrm{CuSO_4}$ to $\mathrm{CuSO_4 \cdot 5H_2O}$ is $-x\mathrm{kJ}$. The value of x is _____. (nearest integer).

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/pdCZT8Hx7e

Q40 JEE Main 2024 · 5 Apr · Shift 2

Combustion of 1 mole of benzene is expressed at

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

The standard enthalpy of combustion of $2\mathrm{mol}$ of benzene is $-'x'\mathrm{kJ}$. $x =$ _____.

Given :

1. standard Enthalpy of formation of $1\mathrm{mol}$ of $\mathrm{C_6H_6(l)}$, for the reaction $6\mathrm{C}$ (graphite) $+3\mathrm{H_2(g)} \rightarrow \mathrm{C_6H_6(l)}$ is $48.5\mathrm{kJmol^{-1}}$.

2. Standard Enthalpy of formation of $1\mathrm{mol}$ of $\mathrm{CO_2(g)}$, for the reaction C (graphite) $+\mathrm{O_2(g)} \rightarrow \mathrm{CO_2(g)}$ is $-393.5\mathrm{kJmol^{-1}}$.

3. Standard and Enthalpy of formation of $1\mathrm{mol}$ of $\mathrm{H_2O(l)}$, for the reaction

$$\mathrm{H_2(g)} + \frac{1}{2}\mathrm{O_2(g)} \rightarrow \mathrm{H_2O(l)}$$

is $-286\mathrm{kJmol^{-1}}$.

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/nyl9kImEEa

Q41 JEE Main 2024 · 30 Jan · Shift 2

Two reactions are given below:

$$2\mathrm{Fe}_{(s)} + \frac{3}{2}\mathrm{O}_{2(g)} \rightarrow \mathrm{Fe}_2\mathrm{O}_{3(s)}, \Delta\mathrm{H}^\circ = -822\mathrm{kJ/mol}$$
$$\mathrm{C}_{(s)} + \frac{1}{2}\mathrm{O}_{2(g)} \rightarrow \mathrm{CO}_{(g)}, \Delta\mathrm{H}^\circ = -110\mathrm{kJ/mol}$$

Then enthalpy change for following reaction

$$3\mathrm{C}_{(s)} + \mathrm{Fe}_2\mathrm{O}_{3(s)} \rightarrow 2\mathrm{Fe}_{(s)} + 3\mathrm{CO}_{(g)}$$

is _____ $\mathrm{kJ/mol}$.

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/dJ0SvTSzYb

Q42 JEE Main 2023 · 6 Apr · Shift 2

Consider the following data

Heat of combustion of $\mathrm{H}_2(\mathrm{g})$ $= -241.8\mathrm{kJmol}^{-1}$

Heat of combustion of $\mathrm{C(s)}$ $= -393.5\mathrm{kJmol}^{-1}$

Heat of combustion of

$$\mathrm{C}_2\mathrm{H}_5\mathrm{OH(l)} = -1234.7\mathrm{kJmol}^{-1}$$

The heat of formation of $\mathrm{C}_2\mathrm{H}_5\mathrm{OH(l)}$ is $(-)$ _____ kJmol^{-1} (Nearest integer).

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/oBEuZ_lS_9

Q43 JEE Main 2022 · 25 Jul · Shift 2

While performing a thermodynamics experiment, a student made the following observations.

HCl + NaOH $\rightarrow$ NaCl + $\mathrm{H_2O}$ ΔH = -57.3 kJ mol^{-1}

$\mathrm{CH_3COOH}$ + NaOH $\rightarrow$ $\mathrm{CH_3COONa}$ + $\mathrm{H_2O}$ ΔH = -55.3 kJ mol^{-1}

The enthalpy of ionization of $\mathrm{CH_3COOH}$ as calculated by the student is _____ kJ mol^{-1}. (nearest integer)

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/5CUvSK_ItC

Q44 JEE Main 2022 · 25 Jul · Shift 1

The enthalpy of combustion of propane, graphite and dihydrogen at $298\mathrm{K}$ are $-2220.0\mathrm{kJmol}^{-1}$, $-393.5\mathrm{kJmol}^{-1}$ and $-285.8\mathrm{kJmol}^{-1}$ respectively. The magnitude of enthalpy of formation of propane $(\mathrm{C_3H_8})$ is _____ $\mathrm{kJ\,mol}^{-1}$. (Nearest integer)

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/aoKOQae8Co

Q45 JEE Main 2022 · 25 Jun · Shift 2

At 25°C and 1 atm pressure, the enthalpy of combustion of benzene (I) and acetylene (g) are -3268 kJ mol^{-1} and -1300 kJ mol^{-1}, respectively. The change in enthalpy for the reaction 3 $C_2H_2(g) \rightarrow C_6H_6$ (I), is :

(A) +324 kJ mol^{-1}

(B) +632 kJ mol^{-1}

(C) $-$ 632 kJ mol^{-1}

(D) $-$ 732 kJ mol^{-1}

Step-by-step solution ▸ prepwiser.in/questions/JBjXdSFU5L

Q46 JEE Main 2021 · 17 Mar · Shift 1

The standard enthalpies of formation of Al_2O_3 and CaO are -1675 kJ mol^{-1} and -635 kJ mol^{-1} respectively.

For the reaction

$3CaO + 2Al \rightarrow 3Ca + Al_2O_3$ the standard reaction enthalpy Δ_rH^0 = _____ kJ.

(Round off to the Nearest Integer)

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/-qg1WYTtzf

Q47 JEE Main 2020 · 7 Jan · Shift 2

The standard heat of formation $\left(\Delta_f H^0_{298}\right)$ of ethane (in kj/mol), if the heat of combustion of ethane, hydrogen and graphite are - 1560, -393.5 and -286 Kj/mol, respectively is :

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/H9TTahvNWn

First Law and Internal Energy · 23 PYQs

Q48 JEE Main 2025 · 4 Apr · Shift 1

One mole of an ideal gas expands isothermally and reversibly from $10\mathrm{dm}^3$ to $20\mathrm{dm}^3$ at 300 K . $\Delta \mathrm{U}, \mathrm{q}$ and work done in the process respectively are

Given: $\mathrm{R} = 8.3\mathrm{JK}^{-1}\mathrm{mol}^{-1}$

$\ln 10 = 2.3$

$\log 2 = 0.30$

$\log 3 = 0.48$

(A) $0, 21.84\mathrm{kJ}, -1.726\mathrm{J}$

(B) $0, 21.84\mathrm{kJ}, 21.84\mathrm{kJ}$

(C) $0, 1.718\mathrm{kJ}, -1.718\mathrm{kJ}$

(D) $0, -17.18\mathrm{kJ}, 1.718\mathrm{J}$

Step-by-step solution ▸ prepwiser.in/questions/MLW52cARrD

Q49 JEE Main 2025 · 29 Jan · Shift 1

500 J of energy is transferred as heat to 0.5 mol of Argon gas at 298 K and 1.00 atm. The final temperature and the change in internal energy respectively are: Given: R = 8.3 J K^{-1} mol^{-1}

(A) 368 K and 500 J

(B) 348 K and 300 J

(C) 378 K and 300 J

(D) 378 K and 500 J

Step-by-step solution ▸ prepwiser.in/questions/mqm4nrekoR

Q50 JEE Main 2025 · 22 Jan · Shift 1

A liquid when kept inside a thermally insulated closed vessel at $25^{\circ}\mathrm{C}$ was mechanically stirred from outside. What will be the correct option for the following thermodynamic parameters ?

(A) $\Delta \mathrm{U}=0, \mathrm{q}<0, \mathrm{w}>0$

(B) $\Delta \mathrm{U}>0, \mathrm{q}=0, \mathrm{w}>0$

(C) $\Delta \mathrm{U}=0, \mathrm{q}=0, \mathrm{w}=0$

(D) $\Delta \mathrm{U}<0, \mathrm{q}=0, \mathrm{w}>0$

Step-by-step solution ▸ prepwiser.in/questions/ePcJ5uAqQ7

Q51 JEE Main 2024 · 6 Apr · Shift 1

An ideal gas, $\overline{\mathrm{C}}_{\mathrm{v}}=\frac{5}{2} \mathrm{R}$, is expanded adiabatically against a constant pressure of 1 atm untill it doubles in volume. If the initial temperature and pressure is $298 \mathrm{K}$ and $5 \mathrm{atm}$, respectively then the final temperature is _____ K (nearest integer).

[$\overline{\mathrm{c}}_{\mathrm{v}}$ is the molar heat capacity at constant volume]

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/jTcX6wjtqG

Q52 JEE Main 2024 · 5 Apr · Shift 1

The heat of combustion of solid benzoic acid at constant volume is $-321.30 \mathrm{kJ}$ at $27^{\circ}\mathrm{C}$. The heat of combustion at constant pressure is $(-321.30-x \mathrm{R}) \mathrm{kJ}$, the value of x is _____.

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/xOlgo807g3

Q53 JEE Main 2024 · 4 Apr · Shift 2

Three moles of an ideal gas are compressed isothermally from $60 \mathrm{L}$ to $20 \mathrm{L}$ using constant pressure of $5 \mathrm{atm}$. Heat exchange Q for the compression is - _____ Lit. atm.

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/s6alCoSa_P

Q54 JEE Main 2024 · 1 Feb · Shift 1

Choose the correct option for free expansion of an ideal gas under adiabatic condition from the following :

(A) $\mathrm{q}=0, \Delta \mathrm{T}=0, \mathrm{w}=0$

(B) $\mathrm{q}=0, \Delta \mathrm{T} \neq 0, \mathrm{w}=0$

(C) $\mathrm{q} \neq 0, \Delta \mathrm{T}=0, \mathrm{w}=0$

(D) $\mathrm{q}=0, \Delta \mathrm{T}<0, \mathrm{w} \neq 0$

Step-by-step solution ▸ prepwiser.in/questions/NfRDGUsHho

Q55 JEE Main 2024 · 31 Jan · Shift 2

If 5 moles of an ideal gas expands from $10\mathrm{L}$ to a volume of $100\mathrm{L}$ at $300\mathrm{K}$ under isothermal and reversible condition then work, w, is $-x\mathrm{J}$. The value of x is _____.

(Given R = 8.314 J K^{-1} mol^{-1})

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/5FBsz3q1H6

Q56 JEE Main 2024 · 27 Jan · Shift 1

If three moles of an ideal gas at $300\mathrm{K}$ expand isothermally from $30\mathrm{dm}^3$ to $45\mathrm{dm}^3$ against a constant opposing pressure of $80\mathrm{kPa}$, then the amount of heat transferred is _____ J.

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/UrWbTZDLJj

Q57 JEE Main 2023 · 11 Apr · Shift 2

The total number of intensive properties from the following is _____

Volume, Molar heat capacity, Molarity, E^{θ} cell, Gibbs free energy change, Molar mass, Mole

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/aqmuwJg9JW

Q58 JEE Main 2023 · 30 Jan · Shift 1

When 2 litre of ideal gas expands isothermally into vacuum to a total volume of 6 litre, the change in internal energy is _____ J. (Nearest integer)

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/iVMuny7Ine

Q59 JEE Main 2023 · 30 Jan · Shift 2

1 mole of ideal gas is allowed to expand reversibly and adiabatically from a temperature of $27^{\circ}\mathrm{C}$. The work done is $3\mathrm{kJmol}^{-1}$. The final temperature of the gas is _____ K (Nearest integer).

Given $\mathrm{C_V} = 20\mathrm{Jmol}^{-1}\mathrm{K}^{-1}$

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/5KBgDKN_Z8

Q60 JEE Main 2023 · 29 Jan · Shift 2

Which of the following relations are correct?

(A) $\Delta\mathrm{U} = \mathrm{q} + \mathrm{p}\Delta\mathrm{V}$

(B) $\Delta\mathrm{G} = \Delta\mathrm{H} - \mathrm{T}\Delta\mathrm{S}$

(C) $\Delta\mathrm{S} = \frac{q_{rev}}{T}$

(D) $\Delta\mathrm{H} = \Delta\mathrm{U} - \Delta\mathrm{nRT}$

Choose the most appropriate answer from the options given below :

(A) A and B only

(B) B and C only

(C) C and D only

(D) B and D only

Step-by-step solution ▸ prepwiser.in/questions/7HnW31KN3N

Q61 JEE Main 2022 · 28 Jul · Shift 2

Among the following the number of state variables is _____.

Internal energy (U)

Volume (V)

Heat (q)

Enthalpy (H)

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/QWCn2ckcoF

Q62 JEE Main 2022 · 29 Jun · Shift 2

2.2 g of nitrous oxide (N_2O) gas is cooled at a constant pressure of 1 atm from 310 K to 270 K causing the compression of the gas from 217.1 mL to 167.75 mL. The change in internal energy of the process, ΔU is '$-$x' J. The value of 'x' is _____. [nearest integer]

(Given : atomic mass of N = 14 g mol^{-1} and of O = 16 g mol^{-1}. Molar heat capacity of N_2O is 100 J K^{-1} mol^{-1})

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/_0xbZIH7yE

Q63 JEE Main 2022 · 28 Jun · Shift 1

4.0 L of an ideal gas is allowed to expand isothermally into vacuum until the total volume is 2.0 L. The amount of heat absorbed in this expansion is _____ L atm.

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/tbAp-T9KSu

Q64 JEE Main 2022 · 27 Jun · Shift 2

When 5 moles of He gas expand isothermally and reversibly at 300 K from 10 litre to 20 litre, the magnitude of the maximum work obtained is _____ J. [nearest integer] (Given : R = 8.3 J K^{-1} mol^{-1} and log 2 = 0.3010)

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/h1GhtqL7yU

Q65 JEE Main 2021 · 25 Jul · Shift 2

A system does 200 J of work and at the same time absorbs 150 J of heat. The magnitude of the change in internal energy is _____ J. (Nearest integer)

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/sqaL0F81jw

Q66 JEE Main 2021 · 16 Mar · Shift 2

At 25°C, 50 g of iron reacts with HCl to form $FeCl_2$. The evolved hydrogen gas expands against a constant pressure of 1 bar. The work done by the gas during this expansion is _____ J. (Round off to the Nearest Integer).

[Given : R = 8.314 J mol^{-1} K^{-1}. Assume, hydrogen is an ideal gas] [Atomic mass of Fe is 55.85 u]

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/yrZB8rWNZg

Q67 JEE Main 2021 · 25 Feb · Shift 2

Five moles of an ideal gas at 293 K is expanded isothermally from an initial pressure of 2.1 MPa to 1.3 MPa against at constant external pressure 4.3 MPa. The heat transferred in this process is _____ kJ mol^{-1}. (Rounded off to the nearest integer) [Use R = 8.314 J $mol^{-1}K^{-1}$]

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/zbo0pBBLMH

Q68 JEE Main 2020 · 4 Sep · Shift 2

Five moles of an ideal gas at 1 bar and 298 K is expanded into vacuum to double the volume. The work done is :

(A) Zero

(B) -RT $\ln \frac{V_2}{V_1}$

(C) $C_V (T_2 - T_1)$

(D) $- RT (V_2 - V_1)$

Step-by-step solution ▸ prepwiser.in/questions/50YqttB791

Q69 JEE Main 2020 · 2 Sep · Shift 1

The internal energy change (in J) When 90 g of water undergoes complete evaporation at 100^oC is _____.

(Given : ΔH_{vap} for water at 373 K = 41 kJ/mol,

R = 8.314 JK^{-1} mol^{-1})

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/3J6RN8f1dL

Q70 JEE Main 2020 · 8 Jan · Shift 2

At constant volume, 4 mol of an ideal gas when heated from 300 K to 500K changes its internal energy by 5000 J. The molar heat capacity at constant volume is _____.

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/WYeq7xQ7Iq

Gibbs Free Energy · 17 PYQs

Q71 JEE Main 2025 · 4 Apr · Shift 1

Let us consider a reversible reaction at temperature, T. In this reaction, both ΔH and ΔS were observed to have positive values. If the equilibrium temperature is Te , then the reaction becomes spontaneous at:

(A) $\mathrm{Te} > \mathrm{T}$

(B) $\mathrm{T} > \mathrm{Te}$

(C) $\mathrm{T} = \mathrm{Te}$

(D) $\mathrm{Te} = 5\mathrm{T}$

Step-by-step solution ▸ prepwiser.in/questions/q7gpCC7ugo

Q72 JEE Main 2025 · 24 Jan · Shift 1

Let us consider an endothermic reaction which is non-spontaneous at the freezing point of water. However, the reaction is spontaneous at boiling point of water. Choose the correct option.

(A) Both ΔH and ΔS are (-ve)

(B) ΔH is $(+ve)$ but ΔS is (-ve)

(C) ΔH is $(-ve)$ but ΔS is (+ve)

(D) Both ΔH and ΔS are (+ve)

Step-by-step solution ▸ prepwiser.in/questions/yWVUdF7NUN

Q73 JEE Main 2025 · 23 Jan · Shift 1

The standard enthalpy and standard entropy of decomposition of N_2O_4 to NO_2 are $55.0 kJ mol^{-1}$ and $175.0 J/K/mol$ respectively. The standard free energy change for this reaction at $25^\circ C$ in J mol^{-1} is _____ (Nearest integer)

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/64dGJh_Eg0

Q74 JEE Main 2025 · 23 Jan · Shift 2

The effect of temperature on spontaneity of reactions are represented as :

	ΔH	ΔS	Temperature	Spontaneity
(A)	+	−	any T	Non spontaneous
(B)	+	+	low T	spontaneous
(C)	−	−	low T	Non spontaneous
(D)	−	+	any T	spontaneous

The incorrect combinations are :

(A) (A) and (C) only

(B) (B) and (D) only

(C) (A) and (D) only

(D) (B) and (C) only

Step-by-step solution ▸ prepwiser.in/questions/1k0eBgf4Oz

Q75 JEE Main 2024 · 6 Apr · Shift 2

For the reaction at

$$298 K, 2A + B \rightarrow C, \Delta H = 400 kJ mol^{-1}$$

and $\Delta S = 0.2 kJ mol^{-1} K^{-1}$. The reaction will become spontaneous above _____ K.

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/NFVsstkqqo

Q76 JEE Main 2024 · 1 Feb · Shift 2

For a certain reaction at $300\mathrm{K}, \mathrm{K}=10$, then $\Delta \mathrm{G}^{\circ}$ for the same reaction is - _____ $\times 10^{-1} \mathrm{kJmol}^{-1}$.

(Given $\mathrm{R}=8.314 \mathrm{JK}^{-1} \mathrm{mol}^{-1}$)

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/r1701HamY0

Q77 JEE Main 2024 · 27 Jan · Shift 2

For a certain thermochemical reaction $\mathrm{M} \rightarrow \mathrm{N}$ at

$$\mathrm{T}=400 \mathrm{K}, \Delta \mathrm{H}^{\ominus}=77.2 \mathrm{kJmol}^{-1}, \Delta \mathrm{S}=122 \mathrm{JK}^{-1}, \log$$

equilibrium constant $(\log K)$ is _____ $\times 10^{-1}$.

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/c225A4mVV-

Q78 JEE Main 2023 · 15 Apr · Shift 1

$30.4 \mathrm{kJ}$ of heat is required to melt one mole of sodium chloride and the entropy change at the melting point is $28.4 \mathrm{JK}^{-1} \mathrm{mol}^{-1}$ at 1 atm. The melting point of sodium chloride is _____ K (Nearest Integer)

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/n_pv5xXIyL

Q79 JEE Main 2023 · 6 Apr · Shift 1

The value of $\log \mathrm{K}$ for the reaction $\mathrm{A} \rightleftharpoons \mathrm{B}$ at $298 \mathrm{K}$ is _____. (Nearest integer)

Given: $\Delta \mathrm{H}^{\circ}=-54.07 \mathrm{kJmol}^{-1}$

$\Delta \mathrm{S}^{\circ}=10 \mathrm{JK}^{-1} \mathrm{mol}^{-1}$

(Take $2.303 \times 8.314 \times 298=5705$)

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/Q9uBdD8NdW

Q80 JEE Main 2022 · 25 Jun · Shift 1

The standard entropy change for the reaction

4Fe(s) + $3O_2$(g) $\rightarrow$ $2Fe_2O_3$(s) is -550 J K^{-1} at 298 K.

[Given : The standard enthalpy change for the reaction is -165 kJ mol^{-1}]. The temperature in K at which the reaction attains equilibrium is _____. (Nearest Integer)

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/tP43_OuCel

Q81 JEE Main 2021 · 1 Sep · Shift 2

For the reaction, $2NO_2$(g) $\rightleftharpoons$ N_2O_4(g), when $\Delta S = -176.0$ JK^{-1} and $\Delta H = -57.8$ kJ mol^{-1}, the magnitude of Δ G at 298 K for the reaction is _____ kJ mol^{-1}. (Nearest integer)

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/EbBJLO3Ps0

Q82 JEE Main 2021 · 27 Aug · Shift 2

Data given for the following reaction is as follows :

$FeO_{(s)} + C_{(graphite)} \rightarrow Fe_{(s)} + CO_{(g)}$

Substance	ΔH° (kJ mol^{-1})	ΔS° (J mol^{-1} K^{-1})
$FeO_{(s)}$	-266.3	57.49
$C_{(graphite)}$	0	5.74
$Fe_{(s)}$	0	27.28
$CO_{(g)}$	-110.5	197.6

The minimum temperature in K at which the reaction becomes spontaneous is _____. (Integer answer)

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/hPsNVa2EaA

Q83 JEE Main 2021 · 20 Jul · Shift 2

For a given chemical reaction A $\rightarrow$ B at 300 K the free energy change is -49.4 kJ mol^{-1} and the enthalpy of reaction is 51.4 kJ mol^{-1}. The entropy change of the reaction is _____ JK^{-1} mol^{-1}.

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/TvbwsfCxBR

Q84 JEE Main 2021 · 26 Feb · Shift 1

For a chemical reaction A + B $\rightleftharpoons$ C + D

($\Delta_r H^{\Theta}$ = 80 kJ mol^{-1}) the entropy change $\Delta_r S^{\Theta}$ depends on the temperature T (in K) as $\Delta_r S^{\Theta}$ = 2T (J K^{-1}mol $^{-1}$).

Minimum temperature at which it will become spontaneous is _____ K. (Integer)

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/YnIZ_XjZ0C

Q85 JEE Main 2020 · 6 Sep · Shift 2

For a reaction,

$4M(s) + nO_2(g) \rightarrow 2M_2O_n(s)$

the free energy change is plotted as a function of temperature. The temperature below which the oxide is stable could be inferred from the plot as the point at which :

(A) the free energy change shows a change from negative to positive value

(B) the slope changes from positive to negative

(C) the slope changes from negative to positive

(D) the slope changes from positive to zero

Step-by-step solution ▸ prepwiser.in/questions/vw2MAEM5Mm

Q86 JEE Main 2020 · 5 Sep · Shift 2

For a dimerization reaction,

$2A(g) \rightarrow A_2(g)$

at 298 K, ΔU^o = –20 kJ mol^{-1}, ΔS^o = –30 JK^{-1} mol^{-1},

then the ΔG^o will be _____ J.

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/AXyExqUQM5

Q87 JEE Main 2020 · 7 Jan · Shift 1

For the reaction :

$A(l) \rightarrow 2B(g)$

$\Delta U = 2.1\,kcal,\ \Delta S = 20\,cal\,K^{-1}$ at 300 K

Hence ΔG in kcal is :

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/NNue5V_xjJ

Entropy and Spontaneity · 7 PYQs

Q88 JEE Main 2025 · 24 Jan · Shift 1

Standard entropies of X_2, Y_2 and XY_5 are 70, 50 and $110 JK^{-1}mol^{-1}$ respectively. The temperature in Kelvin at which the reaction

$$\frac{1}{2}X_2 + \frac{5}{2}Y_2 \rightleftharpoons XY_5 \Delta H^{\ominus} = -35 kJmol^{-1}$$

will be at equilibrium is _____ (Nearest integer)

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/fH0wxG7RNI

Q89 JEE Main 2024 · 9 Apr · Shift 2

When $\Delta H_{vap} = 30 kJ/mol$ and

$$\Delta S_{vap} = 75 J mol^{-1} K^{-1}$$

, then the temperature of vapour, at one atmosphere is _____ K.

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/CszJj-lcKS

Q90 JEE Main 2023 · 12 Apr · Shift 1

One mole of an ideal gas at $350 K$ is in a $2.0 L$ vessel of thermally conducting walls, which are in contact with the surroundings. It undergoes isothermal reversible expansion from 2.0 L to $3.0 L$ against a constant pressure of $4 atm$. The change in entropy of the surroundings (ΔS) is _____ JK^{-1} (Nearest integer)

Given: $R = 8.314 JK^{-1} mol^{-1}$.

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/h8tVyntR9M

Q91 JEE Main 2023 · 8 Apr · Shift 2

For complete combustion of ethene.

$$C_2H_4(g) + 3O_2(g) \rightarrow 2CO_2(g) + 2H_2O(l)$$

the amount of heat produced as measured in bomb calorimeter is $1406 kJ mol^{-1}$ at $300 K$. The minimum value of $T\Delta S$ needed to reach equilibrium is $(-)$ _____ kJ. (Nearest integer)

Given : $R = 8.3 JK^{-1} mol^{-1}$

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/uCv-AbI2R8

Q92 JEE Main 2023 · 24 Jan · Shift 1

For independent process at 300 K

Process	$\Delta H / kJ mol^{-1}$	$\Delta S / JK^{-1}$
A	-25	-80
B	-22	40
C	25	-50
D	22	20

The number of non-spontaneous process from the following is _____

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/QD8RyGDozP

Q93 JEE Main 2022 · 28 Jul · Shift 2

Given below are two statements: One is labelled as Assertion $\mathbf{A}$ and the other is labelled as Reason $\mathbf{R}$

Assertion A : The reduction of a metal oxide is easier if the metal formed is in liquid state than solid state.

Reason $\mathbf{R}$: The value of ΔG^{Θ} becomes more on negative side as entropy is higher in liquid state than solid state.

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

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

(B) Both A and R are correct but R is NOT the correct explanation of A

(C) A is correct but R is not correct

(D) A is not correct but R is correct

Step-by-step solution ▸ prepwiser.in/questions/t944l6vvk9

Q94 JEE Main 2021 · 17 Mar · Shift 2

During which of the following processes, does entropy decrease?

(A) Freezing of water to ice at $0^{\circ}C$

(B) Freezing of water to ice at $-10^{\circ}C$

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

(D) Adsorption of CO(g) on lead surface.

(E) Dissolution of NaCl in water

Choose the correct answer from the options given below :

(A) (A), (C) and (E) only

(B) (B) and (C) only

(C) (A), (B), (C) and (D) only

(D) (A) and (E) only

Step-by-step solution ▸ prepwiser.in/questions/cr0wQW5fbD

Bond Enthalpy · 6 PYQs

Q95 JEE Main 2024 · 4 Apr · Shift 1

The enthalpy of formation of ethane (C_2H_6) from ethylene by addition of hydrogen where the bond-energies of

$$C-H, C-C, C=C, H-H$$

are $414\text{kJ}, 347\text{kJ}, 615\text{kJ}$ and 435kJ respectively is $-$ _____ kJ

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/ClbWWa7nhJ

Q96 JEE Main 2023 · 13 Apr · Shift 1

$$A_2 + B_2 \rightarrow 2AB. \Delta H_f^0 = -200 kJmol^{-1}$$

AB, A_2 and B_2 are diatomic molecules. If the bond enthalpies of A_2, B_2 and AB are in the ratio $1 : 0.5 : 1$, then the bond enthalpy of A_2 is _____ $kJmol^{-1}$ (Nearest integer)

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/dw92aHUzIH

Q97 JEE Main 2023 · 1 Feb · Shift 2

The correct order of bond enthalpy ($kJmol^{-1}$) is :

(A) $C - C > Si - Si > Sn - Sn > Ge - Ge$

(B) $Si - Si > C - C > Ge - Ge > Sn - Sn$

(C) $C - C > Si - Si > Ge - Ge > Sn - Sn$

(D) $Si - Si > C - C > Sn - Sn > Ge - Ge$

Step-by-step solution ▸ prepwiser.in/questions/VPWQo3UBsL

Q98 JEE Main 2023 · 29 Jan · Shift 1

The bond dissociation energy is highest for

(A) Cl_2

(B) I_2

(C) Br_2

(D) F_2

Step-by-step solution ▸ prepwiser.in/questions/sAe2An9Ejx

Q99 JEE Main 2021 · 25 Jul · Shift 1

At 298.2 K the relationship between enthalpy of bond dissociation (in kJ mol^{-1}) for hydrogen (E_H) and its isotope, deuterium (E_D), is best described by :

(A) $E_H = \frac{1}{2}E_D$

(B) $E_H = E_D$

(C) $E_H \simeq E_D - 7.5$

(D) $E_H = 2E_D$

Step-by-step solution ▸ prepwiser.in/questions/bZuaTmTI89

Q100 JEE Main 2020 · 8 Jan · Shift 2

Arrange the following bonds according to their average bond energies in descending order :
C–Cl, C–Br, C–F, C–I

(A) C–Br > C–I > C–Cl > C–F

(B) C–Cl > C–Br > C–I > C–F

(C) C–I > C–Br > C–Cl > C–F

(D) C–F > C–Cl > C–Br > C–I

Step-by-step solution ▸ prepwiser.in/questions/SBG-ej5mmV

Lattice Energy and Born-Haber Cycle · 4 PYQs

Q101 JEE Main 2023 · 13 Apr · Shift 2

Identify the correct order of standard enthalpy of formation of sodium halides :

(A) $NaI < NaBr < NaCl < NaF$

(B) $NaI < NaBr < NaF < NaCl$

(C) $NaF < NaCl < NaBr < NaI$

(D) $NaCl < NaF < NaBr < NaI$

Step-by-step solution ▸ prepwiser.in/questions/39sYtpnh6x

Q102 JEE Main 2021 · 26 Aug · Shift 1

The Born-Haber cycle for KCl is evaluated with the following data :

$\Delta_f H^\Theta$ for KCl = -436.7 kJ mol^{-1} ;

$\Delta_{sub} H^\Theta$ for K = 89.2 kJ mol^{-1} ;

$\Delta_{ionization} H^\Theta$ for K = 419.0 kJ mol^{-1} ;

$\Delta_{electron\ gain} H^\Theta$ for $Cl_{(g)}$ = -348.6 kJ mol^{-1} ;

$\Delta_{bond} H^\Theta$ for Cl_2 = 243.0 kJ mol^{-1}

The magnitude of lattice enthalpy of KCl in kJ mol^{-1} is _____ (Nearest integer)

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/EGe9cYK4nY

Q103 JEE Main 2021 · 25 Feb · Shift 1

The ionization enthalpy of Na^+ formation from $Na_{(g)}$ is 495.8 kJ mol^{-1}, while the electron gain enthalpy of Br is -325.0 kJ mol^{-1}. Given the lattice enthalpy of NaBr is -728.4 kJ mol^{-1}. The energy for the formation of NaBr ionic solid is $(-)$ _____ $\times 10^{-1}$ kJ mol^{-1}.

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/-Tb8lV1K6G

Q104 JEE Main 2020 · 5 Sep · Shift 2

Lattice enthalpy and enthalpy of solution of NaCl are 788 kJ mol^{-1}, and 4 kJ mol^{-1}, respectively.
The hydration enthalpy of NaCl is :

(A) –780 kJ mol^{-1}

(B) –784 kJ mol^{-1}

(C) 780 kJ mol^{-1}

(D) 784 kJ mol^{-1}

Step-by-step solution ▸ prepwiser.in/questions/j0n8doATuX

Answer key — Chemical Thermodynamics

Numbers match the question numbers above. For full working, open the solution link under each question.

1	**C**	2	**C**	3	**2500**	4	**2**	5	**38**	6	**B**	7	**56**	8	**4**
9	**4**	10	**1200**	11	**499**	12	**1006**	13	**173**	14	**610**	15	**360**	16	**D**
17	**35**	18	**2**	19	**57**	20	**200**	21	**117**	22	**600**	23	**727**	24	**38**
25	**C**	26	**82**	27	**38**	28	**31**	29	**82**	30	**101**	31	**21**	32	**741**
33	**B**	34	**326400**	35	**B**	36	**48**	37	**C**	38	**95**	39	**82**	40	**6535**
41	**492**	42	**278**	43	**2**	44	**104**	45	**C**	46	**230**	47	**-192**	48	**C**
49	**B**	50	**B**	51	**274**	52	**150**	53	**200**	54	**A**	55	**28721**	56	**1200**
57	**4**	58	**0**	59	**150**	60	**B**	61	**3**	62	**195**	63	**0**	64	**8630**
65	**50**	66	**2218**	67	**15**	68	**A**	69	**189494**	70	**6**	71	**B**	72	**D**
73	**2850**	74	**D**	75	**2000**	76	**57**	77	**37**	78	**1070**	79	**10**	80	**300**
81	**5**	82	**964**	83	**336**	84	**200**	85	**A**	86	**-13540**	87	**-2**	88	**700**
89	**400**	90	**3**	91	**1411**	92	**2**	93	**A**	94	**C**	95	**125**	96	**400**
97	**C**	98	**A**	99	**C**	100	**D**	101	**A**	102	**718**	103	**5576**	104	**B**