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CHEMISTRY · JEE MAIN

Chemical Thermodynamics

Previous Year Questions with answers

229 questions · **182** papers · **2002–2026** · newest paper first

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What is in this PDF: every Chemical Thermodynamics question we hold from past JEE Main and AIEEE papers, with its options and answer. Where an answer comes from a source other than the official final key, it says so next to the answer.

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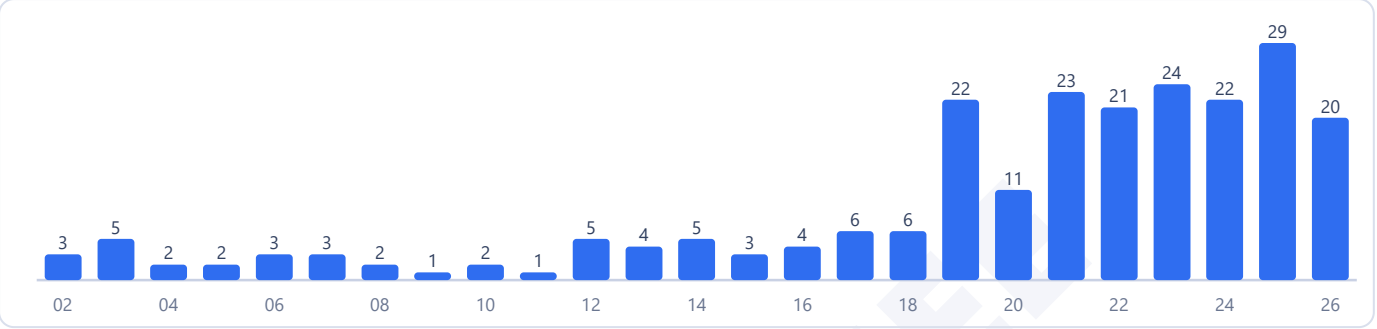
Chapter at a glance

3.8%	229	147 of 162	132 / 97
of Chemistry questions, 2019–2026	questions, 2002–2026	papers asked it, 2019–2026	MCQ / numerical, 2002–2026

Trend. Rising: 1.2 questions per paper in 2024–2026 against 1 in 2019–2023.

Questions per year



Counts are the questions we hold: 229 in 182 papers. No question in this chapter was found repeated across papers.

Most-asked topics in this chapter (2002–2026)



How often it comes up

Chemical thermodynamics establishes criteria for reaction spontaneity and energy changes under Unit 4: Chemical Thermodynamics in the Class 11 curriculum, holding rank 12 among all 31 chemistry chapters with a 3.8 percent share of total chemistry questions. In the computerized exam period spanning 2019 to 2026, candidates answered 172 questions from this chapter across 162 papers, representing an average of 1.1 questions per test shift. The topic featured in 147 of those 162 papers, appearing consistently in every single exam year. During the recent 2024 to 2026 seasons, testing recorded 71 questions across 58 papers, raising the average to 1.2 questions per shift and lifting its subject share to 4.6 percent. This marks a trend that is up compared to the 3.8 percent share across the entire 2019 to 2026 baseline. When measured against the 2002 to 2018 window, which logged 57 questions across 38 papers for a 4.2 percent share, the recent share has stayed about the same. In 2026 alone, examiners presented 20 questions across 19 papers, showing up in 15 separate shifts. Crucially, 97 questions from 2019 to 2026 appeared as numerical answer questions, meaning more than half of all thermodynamics questions in modern tests require precise numerical calculation.

Most-asked topics

Questions in this chapter divide across three prominent conceptual pillars:

- **First Law & Enthalpy**: 87 questions historically, with 68 appearing between 2019 and 2026, tested up to 2026. This area examines the first law of thermodynamics delta U equals q plus w, sign conventions for heat and work, reversible and irreversible isothermal expansions, adiabatic processes, work done from pressure-volume indicator diagrams, and enthalpy relationships delta H equals delta U plus delta n g R T.
- **Thermochemistry**: 74 problems overall, including 55 between 2019 and 2026, continuing into 2026. Focus areas assess Hess's law of constant heat summation, standard enthalpy of formation, enthalpy of combustion, bond dissociation enthalpies, resonance energy, and lattice energy cycles.

- **Entropy & Gibbs Energy**: 68 lifetime problems, with 49 asked from 2019 to 2026, tested in 2026. Concepts explore the second and third laws of thermodynamics, entropy of universe, Gibbs free energy criterion delta G equals delta H minus T delta S, reaction spontaneity conditions, and standard Gibbs energy linked to equilibrium constants via delta G standard equals minus R T ln K.

What the questions look like

JEE Main problems in chemical thermodynamics combine thermodynamic sign conventions with multi-step arithmetic:

- **Hess's law algebraic summation**: Given combustion or formation enthalpies for intermediate reactions, students manipulate and sum algebraic equations to evaluate the unknown standard enthalpy of formation for a target compound.
- **Isothermal work and heat calculations**: Evaluating expansion work, change in internal energy, and absorbed heat for an ideal gas expanding reversibly or irreversibly against external pressure.
- **Standard Gibbs energy and equilibrium constants**: Connecting measured equilibrium constants or reaction quotients at specified temperatures with standard enthalpy and entropy changes.
- **Bond energy bookkeeping**: Calculating individual average bond enthalpies, such as carbon-hydrogen bond strength, from the enthalpy of formation of methane combined with graphite atomization and hydrogen gas dissociation enthalpies.

How to practise it

Pay rigorous attention to IUPAC sign conventions used in chemistry. Work done on the system by surroundings during compression is positive, while work done by the system on surroundings during expansion is negative: w equals minus P external multiplied by delta V. Heat absorbed by the system is positive, and heat released is negative.

For thermochemical cycles using bond energies, remember that reaction enthalpy equals the sum of bond enthalpies of broken bonds in reactants minus the sum of bond enthalpies of formed bonds in products. Contrast this with standard enthalpies of formation, where reaction enthalpy equals products minus reactants.

When calculating spontaneity using Gibbs energy, convert enthalpy and entropy values to matching units before evaluating delta H minus T delta S. Enthalpies are typically given in kilojoules while entropies are given in joules per Kelvin, which is a frequent source of calculation errors.

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Q1 JEE Main 2026 · 8 Apr · Shift 2 Numerical

Consider the reaction

$2H_2S(g) + 3O_2(g) \rightarrow 2H_2O(l) + 2SO_2(g)$

The magnitude of enthalpy change for the reaction in kJ mol^{-1} is _____. (Nearest integer)

Given :

$\Delta_f H^{\ominus}(H_2S) = -20.1$ kJ mol^{-1}

$\Delta_f H^{\ominus}(H_2O) = -286.0$ kJ mol^{-1}

$\Delta_f H^{\ominus}(SO_2) = -297.0$ kJ mol^{-1}

Numerical value type: the answer is a number.

Answer: 1126. · Official NTA final key

Q2 JEE Main 2026 · 6 Apr · Shift 1 MCQ

Arrange the following isothermal processes in order of the magnitude of the work $(p - V)$ involved between states 1 and 2.

A. Expansion in single stage w_A

B. Expansion in multi stages w_B

C. Compression in single stage w_C

D. Compression in multi stages w_D

Choose the correct option.

(A) $|w_B| > |w_A| > |w_C| > |w_D|$

(B) $|w_C| > |w_D| > |w_A| > |w_B|$

(C) $|w_C| > |w_D| > |w_B| > |w_A|$

(D) $|w_B| > |w_A| > |w_D| > |w_C|$

Answer: (C) $|w_C| > |w_D| > |w_B| > |w_A|$ · Official NTA final key

Q3 JEE Main 2026 · 6 Apr · Shift 1 Numerical

Consider the reaction X $\rightleftharpoons$ Y at 300 K. If $\Delta H^{\ominus}$ and K are 28.40 kJ mol^{-1} and 1.8×10^{-7} at the same temperature, then the magnitude of $\Delta S^{\ominus}$ for the reaction in J K^{-1} mol^{-1} is _____. (Nearest integer)
(Given : R = 8.3 J K^{-1} mol^{-1}, ln 10 = 2.3, log 3 = 0.48, log 2 = 0.30)

Numerical value type: the answer is a number.

Answer: 34. · Official NTA final key

Q4 JEE Main 2026 · 6 Apr · Shift 2 MCQ

Match **List - I** with **List - II**.
Given V_1 and V_2 are initial and final volumes respectively.

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List - I (Isothermal process)	List - II (Expression)
A. Reversible expansion	I. $q = 0$
B. Free expansion	II. $q = nRT \ln \frac{V_2}{V_1}$
C. Irreversible Compression	III. $w = -p_{ext}(V_1 - V_2)$
D. Cyclic reversible	IV. $\frac{q_{rev}}{T} = 0$

Choose the **correct** answer from the options given below :

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

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

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

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

Answer: (C) A-II, B-I, C-III, D-IV · Official NTA final key

Q5 JEE Main 2026 · 5 Apr · Shift 2 MCQ

Consider the following data for the reaction

$\mathrm{X_2(g) + Y_2(g) \rightleftharpoons 2XY(g)}$

at 600 K. The $\Delta_r G^{\ominus}$ (in kJ mol^{-1}) for the reaction is :

Compound	$\Delta_f H^{\ominus}_{600\,\mathrm{K}}$ (kJ mol^{-1})	$S^{\ominus}_{600\,\mathrm{K}}$ (J mol^{-1} K^{-1})
XY(g)	42	200
$\mathrm{X_2(g)}$	8	140
$\mathrm{Y_2(g)}$	80	250

(A) -21000

(B) -10

(C) -1000

(D) -9.012

Answer: (B) -10 · Official NTA final key

Q6 JEE Main 2026 · 5 Apr · Shift 2 MCQ

The **correct** order of molar heat capacities measured at 298 K and 1 bar is :

(A) Copper(s) > Bromine(l) > Helium(g)

(B) Bromine(l) > Copper(s) > Helium(g)

(C) Helium(g) > Bromine(l) > Copper(s)

(D) Helium(g) > Bromine(l) = Copper(s)

Answer: (B) Bromine(l) > Copper(s) > Helium(g) · Official NTA final key

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Q7 JEE Main 2026 · 4 Apr · Shift 1 MCQ

Given below are two statements:

Statement I: For an ideal gas, heat capacity at constant volume is always greater than the heat capacity at constant pressure.

Statement II: In a constant volume process, no work is produced and all the heat withdrawn goes into the chaotic motion and is reflected by a temperature increase of the ideal gas.

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

(A) Both Statement I and Statement II are true
(B) Both Statement I and Statement II are false
(C) Statement I is true but Statement II is false
(D) Statement I is false but Statement II is true

Answer: (D) Statement I is false but Statement II is true · Official NTA final key

Q8 JEE Main 2026 · 4 Apr · Shift 2 Numerical

If 3.365g of ethanol (l) is burnt completely in a bomb calorimeter at 298.15 K, the heat produced is 99.472 kJ. The $|\Delta H_f^\circ|$ of ethanol at 298.15 K is _____ $\times 10^2$ kJ mol^{-1}. (Nearest integer)

Given: Standard enthalpy for combustion of graphite $= -393.5$ kJ mol^{-1}
Standard enthalpy of formation of water (l) $= -285.8$ kJ mol^{-1}
Molar mass in g mol^{-1} of C, H, O are 12, 1 and 16 respectively

Numerical value type: the answer is a number.

Answer: 3. · Official NTA final key

Q9 JEE Main 2026 · 2 Apr · Shift 1 MCQ

Consider the following data.

(i) $2Al(s) + 6HCl(aq) \rightarrow Al_2Cl_6(aq) + 3H_2(g) + 1200$ kJ/mol

(ii) $H_2(g) + Cl_2(g) \rightarrow 2HCl(g) + 164$ kJ/mol.

(iii) $HCl(g) + aq \rightarrow HCl(aq) + 83$ kJ/mol.

(iv) $Al_2Cl_6(s) + aq \rightarrow Al_2Cl_6(aq) + 663$ kJ/mol

The enthalpy of formation of anhydrous solid Al_2Cl_6 is :

(A) -648 kJ mol^{-1}
(B) -1350 kJ mol^{-1}
(C) -2002 kJ mol^{-1}
(D) -1527 kJ mol^{-1}

Answer: (D) -1527 kJ mol^{-1} · Official NTA final key

Q10 JEE Main 2026 · 2 Apr · Shift 1 Numerical

At the transition temperature T, $A \rightleftharpoons B$ and $\Delta G^0 = 105 - 35 \log T$ where A and B are two states of substance X. The transition temperature in °C when pressure is 1 atm is _____. (Nearest integer)

Numerical value type: the answer is a number.

Answer: 727. · Official NTA final key

Q11 JEE Main 2026 · 2 Apr · Shift 2 MCQ

Gas 'A' undergoes change from state 'X' to state 'Y'. In this process, the heat absorbed and work done by the gas is 10 J and 18 J respectively. Now gas is brought back to state 'X' by another process during which 6 J of heat is evolved. In the reverse process of 'Y' to 'X',

(A) 18 J of the work is done by the gas 'A'.
(B) 2 J of the work is done by the gas 'A'.
(C) 12 J of the work is done on the gas 'A' by the surrounding.
(D) 14 J of the work is done on the gas 'A' by the surrounding.

Answer: (D) 14 J of the work is done on the gas 'A' by the surrounding. · Official NTA final key

Q12 JEE Main 2026 · 28 Jan · Shift 1 MCQ

20.0 dm^3 of an ideal gas 'X' at 600 K and 0.5 MPa undergoes isothermal reversible expansion until pressure of the gas is 0.2 MPa. Which of the following option is correct?

(Given: log 2 = 0.3010 and log 5 = 0.6989)

(A) $w = -3.9$ kJ, $\Delta U = 0$, $\Delta H = 0$; $q = 3.9$ kJ
(B) $w = 9.1$ J, $\Delta U = 9.1$ J, $\Delta H = 0$; $q = 0$
(C) $w = -9.1$ kJ, $\Delta U = 0$, $\Delta H = 0$, $q = 9.1$ kJ
(D) $w = +4.1$ kJ, $\Delta U = 0$, $\Delta H = 0$; $q = -4.1$ kJ

Answer: (C) $w = -9.1$ kJ, $\Delta U = 0$, $\Delta H = 0$, $q = 9.1$ kJ · Official NTA final key

Q13 JEE Main 2026 · 24 Jan · Shift 1 MCQ

Match the **LIST-I** with **LIST-II**

List-I Isothermal process for ideal gas system	**List-II Work done ($V_f > V_i$)**
A. Reversible expansion	I. $w = 0$
B. Free expansion	II. $w = -nRT \ln \frac{V_f}{V_i}$
C. Irreversible expansion	III. $w = -p_{ex}(V_f - V_i)$
D. Irreversible compression	IV. $w = -p_{ex}(V_i - V_f)$

Choose the *__correct__* answer from the options given below:

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

Answer: (A) A-II, B-I, C-III, D-IV · Official NTA final key

Q14 JEE Main 2026 · 24 Jan · Shift 2 MCQ

The heat of atomisation of methane and ethane are 'x' kJ mol^{-1} and 'y' kJ mol^{-1} respectively. The longest wavelength (λ) of light capable of breaking the C$-$C bond can be expressed in SI unit as:

(A) $\frac{hc}{1000}\left(\frac{y-6x}{4}\right)^{-1}$
(B) $\frac{N_A hc}{250(y-6x)}$
(C) $N_A hc\left(y-\frac{6x}{4}\right)^{-1}$
(D) $\frac{N_A hc}{250(4y-6x)}$

Answer: (D) $\frac{N_A hc}{250(4y-6x)}$ · Official NTA final key

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Q15 JEE Main 2026 · 23 Jan · Shift 1 MCQ

A cup of water at 5°C (system) is placed in a microwave oven and the oven is turned on for one minute during which the water begins to boil. Which of the following option is **true** ?

(A) q$=+$ve, w$=0$, ΔU$=-$ve
(B) q$=+$ve, w$=-$ve, ΔU$=+$ve
(C) q$=+$ve, w$=-$ve, ΔU$=-$ve
(D) q$=-$ve, w$=-$ve, ΔU$=-$ve

Answer: (B) q$=+$ve, w$=-$ve, ΔU$=+$ve · Official NTA final key

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Q16 JEE Main 2026 · 22 Jan · Shift 1 MCQ

Match the **LIST-I** with **LIST-II**

	List-I Thermodynamic Process	**List-II Magnitude in kJ**
A.	Work done in reversible, isothermal expansion of 2 mol of ideal gas from 2 dm^3 to 20 dm^3 at 300 K.	I. 4
B.	Work done in irreversible isothermal expansion of 1 mol ideal gas from 1 m^3 to 3 m^3 at 300 K against a constant pressure of 3kPa.	II. 11.5
C.	Change in internal energy for adiabatic expansion of a 1 mol ideal gas with change of temperature = 320 K and $\bar{C}_V = \frac{3}{2}R$.	III. 6
D.	Change in enthalpy at constant pressure of 1 mol ideal gas with change of temperature = 337 K and $\bar{C}_p = \frac{5}{2}R$.	IV. 7

Choose the **correct** answer from the options given below:

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

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

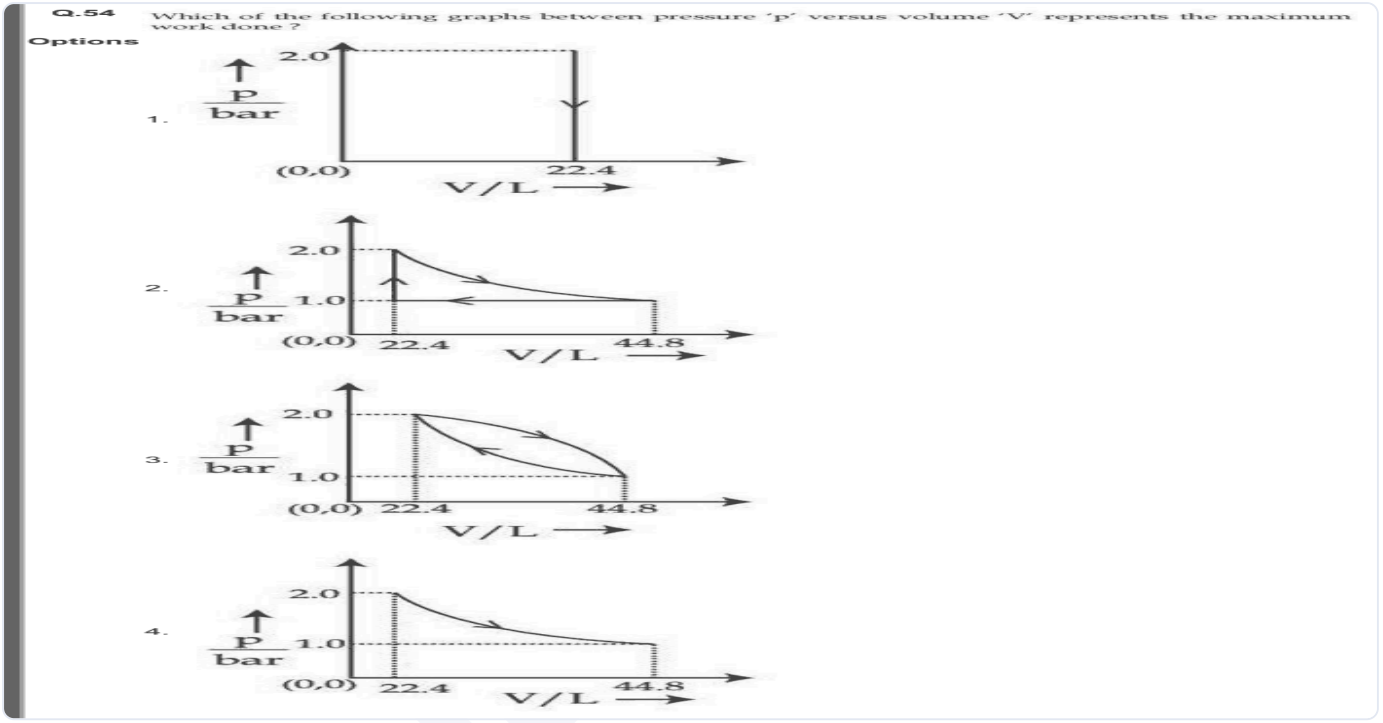
(C) A-I, B-II, C-III, D-IV

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

Answer: (D) A-II, B-III, C-I, D-IV · Official NTA final key

Q17 JEE Main 2026 · 21 Jan · Shift 1 MCQ

Which of the following graphs between pressure 'p' versus volume 'V' represents the maximum work done ?



(A) *see figure*

(B) *see figure*

(C) *see figure*

(D) *see figure*

Answer: (A) · Official NTA final key

Q18 JEE Main 2026 · 21 Jan · Shift 1 MCQ

For the reaction, $N_2O_4 = 2NO_2$, graph is plotted as shown below. Identify **correct** statements.

A. Standard free energy change for the reaction is -5.40 kJ mol^{-1}.

B. As $\Delta G^{\ominus}$ in graph is positive, N_2O_4 will not dissociate into NO_2 at all.

C. Reverse reaction will go to completion.

D. When 1 mole of N_2O_4 changes into equilibrium mixture, value of $\Delta G^{\ominus} = -0.84$ kJ mol^{-1}

E. When 2 mole of NO_2 changes into equilibrium mixture, $\Delta G^{\ominus}$ for equilibrium mixture is -6.24 kJ mol^{-1}.

(see the figure above)

Choose the **correct** answer from the options given below :

Q.67 For the reaction, $N_2O_4 \rightleftharpoons 2NO_2$, graph is plotted as shown below. Identify **correct** statements.

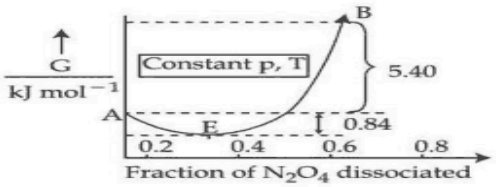
A. Standard free energy change for the reaction is -5.40 kJ mol^{-1}.

B. As $\Delta G^{\ominus}$ in graph is positive, N_2O_4 will not dissociate into NO_2 at all.

C. Reverse reaction will go to completion.

D. When 1 mole of N_2O_4 changes into equilibrium mixture, value of $\Delta G^{\ominus} = -0.84$ kJ mol^{-1}

E. When 2 mole of NO_2 changes into equilibrium mixture, $\Delta G^{\ominus}$ for equilibrium mixture is -6.24 kJ mol^{-1}.



Choose the **correct** answer from the options given below :

Options

1. B and C only
2. A and D only
3. D and E only
4. C and E only

(A) B and C only

(B) A and D only

(C) D and E only

(D) C and E only

Answer: (C) D and E only · Official NTA final key

Q19 JEE Main 2026 · 21 Jan · Shift 1 Numerical

Use the following data :

Substance	$\Delta_f H^{\ominus}$(500K)/kJ mol^{-1}	$S^{\ominus}$(500K)/J K^{-1} mol^{-1}
AB(g)	32	222
A_2(g)	6	146
B_2(g)	x	280

One mole each of A_2(g) and B_2(g) are taken in a 1 L closed flask and allowed to establish the equilibrium at 500K.

$$A_2(g) + B_2(g) \rightleftharpoons 2AB(g)$$

The value of x (in kJ mol^{-1}) is _____. (Nearest integer)

(Given : log K = 2.2, R = 8.3 J K^{-1} mol^{-1})

Numerical value type: the answer is a number.

Answer: 70. · Official NTA final key

Q20 JEE Main 2026 · 21 Jan · Shift 2 MCQ

Consider the following data :

$\Delta_f H^{\ominus}$ (methane, g) $= -X$ kJ mol^{-1}

Enthalpy of sublimation of graphite $= Y$ kJ mol^{-1}

Dissociation enthalpy of $H_2 = Z$ kJ mol^{-1}

The bond enthalpy of C−H bond is given by :

(A) $\frac{X+Y+4Z}{2}$

(B) $\frac{X+Y+2Z}{4}$

(C) $\frac{-X+Y+Z}{4}$

(D) $X + Y + Z$

Answer: (B) $\frac{X+Y+2Z}{4}$ · Official NTA final key

Q21 JEE Main 2025 · 8 Apr · Shift 2 Numerical

Resonance in X_2Y can be represented as

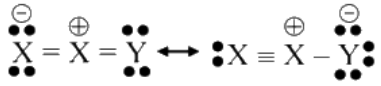
(see the figure above)

The enthalpy of formation of X_2Y $\left(X \equiv X(g) + \frac{1}{2}Y = Y(g) \rightarrow X_2Y(g)\right)$ is $80\,kJ\,mol^{-1}$. The magnitude of resonance energy of X_2Y is _____ $kJmol^{-1}$ (nearest integer value)

Given : Bond energies of $X \equiv X, X = X, Y = Y$ and $X = Y$ are 940, 410, 500 and $602\,kJ\,mol^{-1}$ respectively.

valence X: 3, Y: 2

23. Resonance in X_2Y can be represented as



The enthalpy of formation of $X_2Y\left(X \equiv X(g) + \frac{1}{2}Y = Y(g) \rightarrow X_2Y(g)\right)$ is $80\,kJ\,mol^{-1}$. The magnitude of resonance energy of X_2Y is _____ $kJmol^{-1}$ (nearest integer value)

Given : Bond energies of $X \equiv X, X = X, Y = Y$ and $X = Y$ are 940, 410, 500 and $602\,kJ\,mol^{-1}$ respectively.

valence X: 3, Y : 2

Numerical value type: the answer is a number.

Answer: 98. · Key from source paper

Q22 JEE Main 2025 · 7 Apr · Shift 1 MCQ

Total enthalpy change for freezing of 1 mol of water at $10^{\circ}C$ to ice at $-10^{\circ}C$ is

(Given: $\Delta_{fus}H = x\,kJ/mol$

$C_p[H_2O(l)] = y\,Jmol^{-1}K^{-1}$

$C_p[H_2O(s)] = z\,Jmol^{-1}K^{-1}$

(A) $x - 10y - 10z$

(B) $-10(100x + y + z)$

(C) $10(100x + y + z)$

(D) $-x - 10y - 10z$

Answer: (B) $-10(100x + y + z)$ · Key from source paper

Q23 JEE Main 2025 · 7 Apr · Shift 2 MCQ

The correct statement amongst the following is :

(A) $\Delta_f H^{\theta}_{500}$ is zero for $O_2(g)$

(B) The term 'standard state' implies that the temperature is $0^{\circ}C$.

(C) $\Delta_f H^{\theta}_{298}$ is zero for $O(g)$

(D) The standard state of a pure gas is the pure gas at a pressure of 1 bar and temperature 273 K.

Answer: (A) $\Delta_f H^{\theta}_{500}$ **is zero for** $O_2(g)$ · Key from source paper

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Q24 JEE Main 2025 · 4 Apr · Shift 1 MCQ

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) $T > Te$

(B) $Te = 5T$

(C) $Te > T$

(D) $T = Te$

Answer: (A) $T > Te$ · Key from source paper

Q25 JEE Main 2025 · 4 Apr · Shift 1 MCQ

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

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

$\ln 10 = 2.3$

$\log 2 = 0.30$

$\log 3 = 0.48$

(A) $0, -17.18kJ, 1.718J$

(B) $0, 21.84kJ, 21.84kJ$

(C) $0, 21.84kJ, -1.726J$

(D) $0, 1.718kJ, -1.718kJ$

Answer: (D) $0, 1.718kJ, -1.718kJ$ · Key from source paper

Q26 JEE Main 2025 · 4 Apr · Shift 2 MCQ

Consider the given data :

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

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

Choose the correct statement :

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

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

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

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

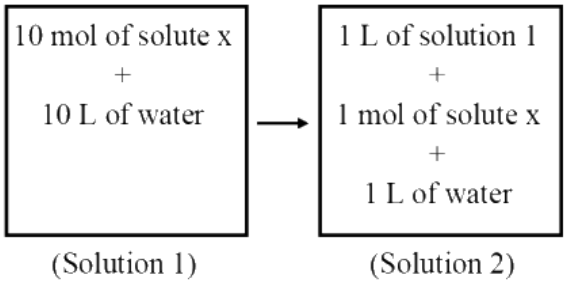
Answer: (A) The heat of solution depends on the amount of solvent. · Key from source paper

Q27 JEE Main 2025 · 3 Apr · Shift 1 MCQ

Which of the following properties will change when system containing solution 1 will become solution 2?

(see the figure above)

7. Which of the following properties will change when system containing solution 1 will become solution 2?



(1) Gibbs free energy

(2) Concentration

(3) Molar heat capacity

(4) Density

(A) Gibbs free energy

(B) Concentration

(C) Molar heat capacity

(D) Density

Answer: (A) Gibbs free energy · Key from source paper

Q28 JEE Main 2025 · 3 Apr · Shift 1 Numerical

Given :

$\Delta H^{\ominus} sub\,[C\,(graphite)] = 710 kJ\,mol^{-1}$

$\Delta_{C-H} H^{\ominus} = 414 kJ\,mol^{-1}$

$\Delta_{H-H} H^{\ominus} = 436 kJ\,mol^{-1}$

$\Delta_{C=C} H^{\ominus} = 611 kJ\,mol^{-1}$

The $\Delta H_f^{\ominus}$ for $CH_2 = CH_2$ is _____ $kJmol^{-1}$ (nearest integer value)

Numerical value type: the answer is a number.

Answer: 25. · Key from source paper

Q29 JEE Main 2025 · 3 Apr · Shift 2 MCQ

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

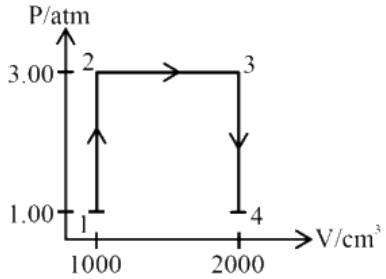
(A) Statement I is false but Statement II is true
(B) Both Statement I and Statement II are false
(C) Statement I is true but Statement II is false
(D) Both Statement I and Statement II are true

Answer: (D) Both Statement I and Statement II are true · Key from source paper

Q30 JEE Main 2025 · 3 Apr · Shift 2 Numerical

see figure

22.



A perfect gas (0.1 mol) having $\overline{C}_v = 1.50R$ (independent of temperature) undergoes the above transformation from point 1 to point 4. If each step is reversible, the total work done (w) while going from point 1 to point 4 is $(-)$ _____ J (nearest integer)

[Given: $R = 0.082\,L\,atm\,K^{-1}\,mol^{-1}$]

Numerical value type: the answer is a number.

Answer: 304. · Key from source paper

Q31 JEE Main 2025 · 3 Apr · Shift 2 Numerical

A sample of n -octane $(1.14g)$ was completely burnt in excess of oxygen in a bomb calorimeter, whose heat capacity is $5kJ\,K^{-1}$. 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 _____ $kJmol^{-1}$ (nearest integer).

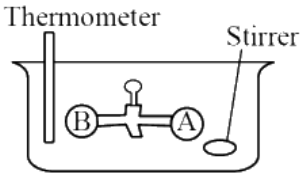
Numerical value type: the answer is a number.

Answer: 2500. · Key from source paper

Q32 JEE Main 2025 · 2 Apr · Shift 1 MCQ

see figure

16.



Two vessels A and B are connected via stopcock. The vessel A is filled with a gas at a certain pressure. The entire assembly is immersed in water and is allowed to come to thermal equilibrium with water. After opening the stopcock the gas from vessel A expands into vessel B and no change in temperature is observed in the thermometer. Which of the following statement is true ?

(1) $dU \neq 0$

(2) $dq \neq 0$

(3) $dw \neq 0$

(4) The pressure in the vessel B before opening the stopcock is zero

(A) $dU \neq 0$

(B) $dq \neq 0$

(C) $dw \neq 0$

(D) The pressure in the vessel B before opening the stopcock is zero

Answer: (D) The pressure in the vessel B before opening the stopcock is zero · Key from source paper

Q33 JEE Main 2025 · 2 Apr · Shift 2 MCQ

Arrange the following in order of magnitude of work done by the system/on the system at constant temperature.

(a) $|w_{reversible}|$ for expansion in infinite stages.

(b) $|w_{irreversible}|$ for expansion in single stage.

(c) $|w_{reversible}|$ for compression in infinite stages.

(d) $|w_{irreversible}|$ for compression in single stage.

Choose the correct answer from the options given below :

(A) $c = a > d > b$

(B) $a > b > c > d$

(C) $a > c > b > d$

(D) $d > c = a > b$

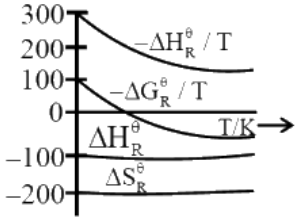
Answer: (D) $d > c = a > b$ · Key from source paper

Q34 JEE Main 2025 · 2 Apr · Shift 2 MCQ

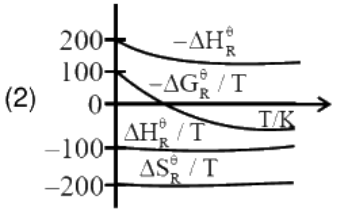
Which of the following graphs correctly represents the variation of thermodynamic properties of Haber's process?

15. Which of the following graphs correctly represents the variation of thermodynamic properties of Haber's process?

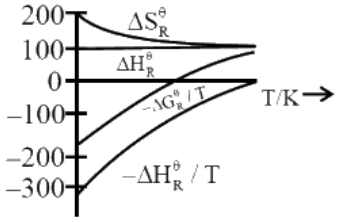
(1)



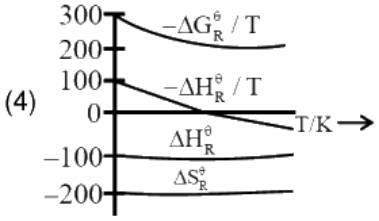
(2)



(3)



(4)



(A) *see figure*
(B) *see figure*
(C) *see figure*
(D) *see figure*

Answer: (A) · Key from source paper

Q35 JEE Main 2025 · 29 Jan · Shift 1 MCQ

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 $\mathrm{K}^{-1}\,\mathrm{mol}^{-1}$

(A) 378 K and 500 J
(B) 368 K and 500 J
(C) 348 K and 300 J
(D) 378 K and 300 J

Answer: (C) 348 K and 300 J · Key from source paper

Q36 JEE Main 2025 · 29 Jan · Shift 2 MCQ

If C (diamond) $\rightarrow C$ (graphite) + XkJmol^{-1} C(diamond) + $\mathrm{O}_2(\mathrm{g}) \rightarrow \mathrm{CO}_2(\mathrm{g})$ + YkJmol^{-1} C (graphite) +$\mathrm{O}_2(\mathrm{g}) \rightarrow \mathrm{CO}_2(\mathrm{g})$ + ZkJmol^{-1} at constant temperature. Then

(A) X=-Y+Z
(B) -X=Y+Z
(C) X=Y+Z
(D) X=Y-Z

Answer: (D) X=Y-Z · Key from source paper

Q37 JEE Main 2025 · 28 Jan · Shift 1 Numerical

The formation enthalpies, $\Delta \mathrm{H_f}^{\ominus}$ for $\mathrm{H}_{(\mathrm{g})}$ and $\mathrm{O}_{(\mathrm{g})}$ are 220.0 and 250.0 kJ mol^{-1}, respectively, at 298.15 K , and $\Delta \mathrm{H_f}^{\ominus}$ for $\mathrm{H_2O}_{(\mathrm{g})}$ is -242.0 kJ mol^{-1} at the same temperature. The average bond enthalpy of the O $-$ H bond in water at 298.15 K is _____ kJmol^{-1} (nearest integer).

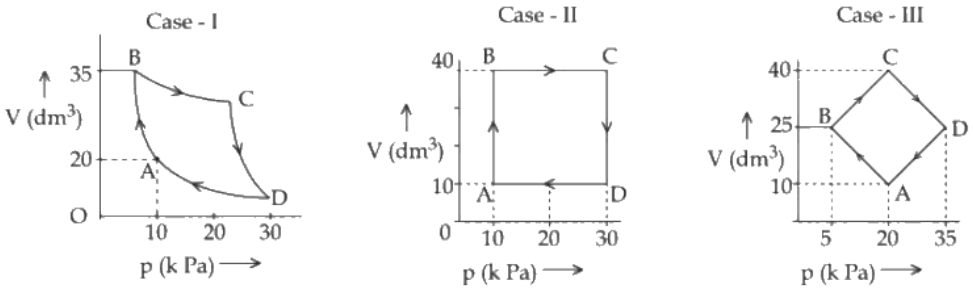
Numerical value type: the answer is a number.

Answer: 466. · Key from source paper

Q38 JEE Main 2025 · 28 Jan · Shift 2 MCQ

see figure

Q67.



An ideal gas undergoes a cyclic transformation starting from the point A and coming back to the same point by tracing the path $\mathrm{A} \rightarrow \mathrm{B} \rightarrow \mathrm{C} \rightarrow \mathrm{D} \rightarrow \mathrm{A}$ as shown in the three cases above. Choose the correct option regarding $\Delta \mathrm{U}$:

(1) $\Delta \mathrm{U}(\text{ Case-I }) = \Delta \mathrm{U}(\text{ Case-II }) = \Delta \mathrm{U}(\text{ Case-III }$)

(2) $\Delta \mathrm{U}(\text{ Case-I }) > \Delta \mathrm{U}(\text{ Case-III }) > \Delta \mathrm{U}(\text{ Case-II }$)

(3) $\Delta \mathrm{U}(\text{ Case-III }) > \Delta \mathrm{U}(\text{ Case-II }) > \Delta \mathrm{U}(\text{ Case-I }$)

(4) $\Delta \mathrm{U}(\text{ Case-I }) > \Delta \mathrm{U}(\text{ Case-II }) > \Delta \mathrm{U}(\text{ Case-III }$)

(A) $\Delta \mathrm{U}(\text{ Case-I }) = \Delta \mathrm{U}(\text{ Case-II }) = \Delta \mathrm{U}(\text{ Case-III })$

(B) $\Delta \mathrm{U}(\text{ Case-I }) > \Delta \mathrm{U}(\text{ Case-III }) > \Delta \mathrm{U}(\text{ Case-II })$

(C) $\Delta \mathrm{U}(\text{ Case-III }) > \Delta \mathrm{U}(\text{ Case-II }) > \Delta \mathrm{U}(\text{ Case-I })$

(D) $\Delta \mathrm{U}(\text{ Case-I }) > \Delta \mathrm{U}(\text{ Case-II }) > \Delta \mathrm{U}(\text{ Case-III })$

Answer: (A) $\Delta \mathrm{U}(\text{ Case-I }) = \Delta \mathrm{U}(\text{ Case-II }) = \Delta \mathrm{U}(\text{ Case-III })$ · Key from source paper

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Q39 JEE Main 2025 · 28 Jan · Shift 2 Numerical

Consider the following data : Heat of formation of $\mathrm{CO}_2(\mathrm{g}) = -393.5 \text{ kJ mol}^{-1}$ Heat of formation of $\mathrm{H}_2\mathrm{O}(\mathrm{l}) = -286.0 \text{ kJ mol}^{-1}$ Heat of combustion of benzene $= -3267.0 \text{ kJ mol}^{-1}$ The heat of formation of benzene is _____ kJmol^{-1}. (Nearest integer)

Numerical value type: the answer is a number.

Answer: 48. · Key from source paper

Q40 JEE Main 2025 · 24 Jan · Shift 1 MCQ

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)

Answer: (D) Both ΔH and ΔS are (+ve) · Key from source paper

Q41 JEE Main 2025 · 24 Jan · Shift 1 Numerical

Standard entropies of X_2, Y_2 and XY_5 are 70,50 and 110 J $\mathrm{K}^{-1} \mathrm{mol}^{-1}$ respectively. The temperature in Kelvin at which the reaction $\frac{1}{2}\mathrm{X}_2 + \frac{5}{2}\mathrm{Y}_2 \rightleftharpoons \mathrm{XY}_5 \Delta\mathrm{H}^{\Theta} = -35 \text{ kJ mol}^{-1}$ will be at equilibrium is _____

. (Nearest integer)

Numerical value type: the answer is a number.

Answer: 700. · Key from source paper

Q42 JEE Main 2025 · 24 Jan · Shift 2 MCQ

Which of the following mixing of 1 M base and 1 M acid leads to the largest increase in temperature?

(A) 30 mL CH_3COOH and 30 mL NaOH

(B) $45mL CH_3COOH and 25mL NaOH$

(C) 30 mL HCl and 30 mL NaOH

(D) 50 mL HCl and 20 mL NaOH

Answer: (C) 30 mL HCl and 30 mL NaOH · Key from source paper

Q43 JEE Main 2025 · 24 Jan · Shift 2 MCQ

$\mathrm{S(g)} + \frac{3}{2}\mathrm{O_2(g)} \rightarrow \mathrm{SO_3(g)} + 2x\,\mathrm{kcal}$ $\mathrm{SO_2(g)} + \frac{1}{2}\mathrm{O_2(g)} \rightarrow \mathrm{SO_3(g)} + y\,\mathrm{kcal}$ The heat of formation of $\mathrm{SO_2(g)}$ is given by :

(A) $x + y$ kcal

(B) $y - 2x$ kcal

(C) $\frac{2x}{y}$ kcal

(D) $2x + y$ kcal

Answer: (B) $y - 2x$ kcal · Key from source paper

Q44 JEE Main 2025 · 23 Jan · Shift 1 MCQ

Ice at -5°C is heated to become vapor with temperature of 110°C at atmospheric pressure. The entropy change associated with this process can be obtained from

(A) $\int_{268K}^{273K} \mathrm{C_{p,m}}\,\mathrm{dT} + \frac{\Delta \mathrm{H_{m,fusion}}}{\mathrm{T_f}} + \frac{\Delta \mathrm{H_{m,vaporisation}}}{\mathrm{T_b}} + \int_{273K}^{373K} \mathrm{C_{p,m}}\,\mathrm{dT} + \int_{373K}^{383K} \mathrm{C_{p,m}}\,\mathrm{dT}$

(B) $\int_{268K}^{273K} \frac{\mathrm{C_{p,m}}}{\mathrm{T}}\,\mathrm{dT} + \frac{\Delta \mathrm{H_{m,fusion}}}{\mathrm{T_f}} + \frac{\Delta \mathrm{H_{m,vaporisation}}}{\mathrm{T_b}} + \int_{273K}^{373K} \frac{\mathrm{C_{p,m}}}{\mathrm{T}}\,\mathrm{dT} + \int_{373K}^{383K} \frac{\mathrm{C_{p,m}}}{\mathrm{T}}\,\mathrm{dT}$

(C) $\int_{268K}^{383K} \mathrm{C_p}\,\mathrm{dT} + \frac{\mathrm{q_{rev}}}{\mathrm{T}}$

(D) $\int_{268K}^{383K} \mathrm{C_p}\,\mathrm{dT} + \frac{\Delta \mathrm{H_{melting}}}{273} + \frac{\Delta \mathrm{H_{boiling}}}{373}$

Answer: (B) $\int_{268K}^{273K} \frac{\mathrm{C_{p,m}}}{\mathrm{T}}\,\mathrm{dT} + \frac{\Delta \mathrm{H_{m,fusion}}}{\mathrm{T_f}} + \frac{\Delta \mathrm{H_{m,vaporisation}}}{\mathrm{T_b}} + \int_{273K}^{373K} \frac{\mathrm{C_{p,m}}}{\mathrm{T}}\,\mathrm{dT} + \int_{373K}^{383K} \frac{\mathrm{C_{p,m}}}{\mathrm{T}}\,\mathrm{dT}$ · Key from source paper

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Q45 JEE Main 2025 · 23 Jan · Shift 1 Numerical

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

Numerical value type: the answer is a number.

Answer: 2850. · Key from source paper

Q46 JEE Main 2025 · 23 Jan · Shift 2 MCQ

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

Answer: (A) (B) and (C) only · Key from source paper

Q47 JEE Main 2025 · 22 Jan · Shift 1 MCQ

A liquid when kept inside a thermally insulated closed vessel at 25°C was mechanically stirred from outside. What will be the correct option for the following thermodynamic parameters ?

(A) $\Delta U < 0, q = 0, w > 0$
(B) $\Delta U = 0, q = 0, w = 0$
(C) $\Delta U > 0, q = 0, w > 0$
(D) $\Delta U = 0, q < 0, w > 0$

Answer: (C) $\Delta U > 0, q = 0, w > 0$ · Key from source paper

Q48 JEE Main 2025 · 22 Jan · Shift 2 MCQ

see figure

Q60.

	List - I (Partial Derivatives)		List - II (Thermodynamic Quantity)
(A)	$\left(\frac{\partial G}{\partial T}\right)_P$	(I)	C_P
(B)	$\left(\frac{\partial H}{\partial T}\right)_P$	(II)	$-S$
(C)	$\left(\frac{\partial G}{\partial P}\right)_T$	(III)	C_V
(D)	$\left(\frac{\partial U}{\partial T}\right)_V$	(IV)	V

Match List - I with List - II.

Choose the correct answer from the options given below :

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

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

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

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

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

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

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

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

Answer: (C) (A)-(II), (B)-(I), (C)-(IV), (D)-(III) · Key from source paper

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Q49 JEE Main 2025 · 22 Jan · Shift 2 Numerical

Consider the following cases of standard enthalpy of reaction (ΔH_r° in $kJmol^{-1}$)

$C_2H_6(g) + \frac{7}{2}O_2(g) \rightarrow 2CO_2(g) + 3H_2O(l)\ \Delta H_1^\circ = -1550$

$C\ (graphite) + O_2(g) \rightarrow CO_2(g)\ \ \Delta H_2^\circ = -393.5$

$H_2(g) + \frac{1}{2}O_2(g) \rightarrow H_2O(l)\ \ \Delta H_3^\circ = -286$

The magnitude of $\Delta H_{f\,C_2H_6(g)}^\circ$ is _____ $kJmol^{-1}$ (Nearest integer).

Numerical value type: the answer is a number.

Answer: 95. · Key from source paper

Q50 JEE Main 2024 · 9 Apr · Shift 1 Numerical

When equal volume of 1MHCl and 1MH_2SO_4 are separately neutralised by excess volume of 1M NaOH solution. x and y kJ of heat is liberated respectively. The value of y/x is _____

Numerical value type: the answer is a number.

Answer: 2. · Key from source paper

Q51 JEE Main 2024 · 9 Apr · Shift 1 Numerical

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

Numerical value type: the answer is a number.

Answer: 82. · Key from source paper

Q52 JEE Main 2024 · 9 Apr · Shift 2 Numerical

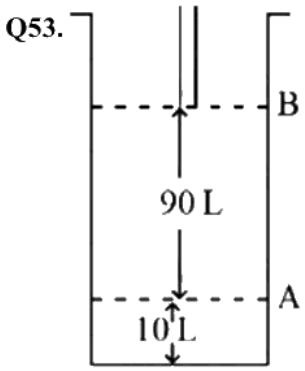
When ΔH_{vap} = 30 kJ/mol and ΔS_{vap} = 75 J mol^{-1} K^{-1}, then the temperature of vapour, at one atmosphere is _____ K.

Numerical value type: the answer is a number.

Answer: 400. · Key from source paper

Q53 JEE Main 2024 · 8 Apr · Shift 1 Numerical

see figure



Consider the figure provided. 1 mol of an ideal gas is kept in a cylinder, fitted with a piston, at the position A, at 18°C. If the piston is moved to position B, keeping the temperature unchanged, then ' x ' L atm work is done in this reversible process. $x =$ _____ L atm. (nearest integer) [Given : Absolute temperature $= {}^\circ\mathrm{C} + 273.15, \mathrm{R} = 0.08206$ L atm mol^{-1} K^{-1}]

Numerical value type: the answer is a number.

Answer: 55. · Key from source paper

Q54 JEE Main 2024 · 8 Apr · Shift 2 Numerical

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

Numerical value type: the answer is a number.

Answer: 38. · Key from source paper

Q55 JEE Main 2024 · 6 Apr · Shift 1 Numerical

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

Numerical value type: the answer is a number.

Answer: 274. · Key from source paper

Q56 JEE Main 2024 · 6 Apr · Shift 2 Numerical

For the reaction at 298 K, $2\,A + B \rightarrow C$. $\Delta H = 400$ kJ mol^{-1} and $\Delta S = 0.2$ kJ mol^{-1} K^{-1}. The reaction will become spontaneous above _____ K.

Numerical value type: the answer is a number.

Answer: 2000. · Key from source paper

Q57 JEE Main 2024 · 5 Apr · Shift 1 MCQ

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

Answer: (C) Both (A) and (R) are true and (R) is the correct explanation of (A) · Key from source paper

Q58 JEE Main 2024 · 5 Apr · Shift 1 Numerical

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

Numerical value type: the answer is a number.

Answer: 150. · Key from source paper

Q59 JEE Main 2024 · 5 Apr · Shift 2 Numerical

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 mol of benzene is $-'x'$kJ. x = _____ Given: 1. standard Enthalpy of formation of 1 mol of $\mathrm{C_6H_6(l)}$, for the reaction 6C (graphite) $+3\mathrm{H_2}$(g) $\rightarrow \mathrm{C_6H_6(l)}$ is 48.5 kJ mol^{-1}. 2. Standard Enthalpy of formation of 1 mol of $\mathrm{CO_2}$(g), for the reaction C (graphite) $+\mathrm{O_2}$(g) $\rightarrow \mathrm{CO_2}$(

g) is -393.5 kJ mol^{-1}. 3. Standard and Enthalpy of formation of 1 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 kJ mol^{-1}.

Numerical value type: the answer is a number.

Answer: 6535. · Key from source paper

Q60 JEE Main 2024 · 4 Apr · Shift 1 Numerical

The enthalpy of formation of ethane $(\mathrm{C_2H_6})$ from ethylene by addition of hydrogen where the bond-energies of C $-$ H, C $-$ C, C = C, H $-$ H are 414 kJ, 347 kJ, 615 kJ and 435 kJ respectively is _____ kJ

Numerical value type: the answer is a number.

Answer: -125. · Checked by our team

Q61 JEE Main 2024 · 4 Apr · Shift 2 Numerical

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

Numerical value type: the answer is a number.

Answer: 200. · Key from source paper

Q62 JEE Main 2024 · 1 Feb · Shift 1 MCQ

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

(A) q = 0, $\Delta T \neq 0$, w = 0
(B) q = 0, $\Delta T < 0$, w $\neq$ 0
(C) q $\neq$ 0, $\Delta T < 0$, w = 0
(D) q = 0, $\Delta T = 0$, w = 0

Answer: (D) q = 0, $\Delta T = 0$, w = 0 · Key from source paper

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Q63 JEE Main 2024 · 1 Feb · Shift 2 Numerical

For a certain reaction at 300 K, K = 10, then ΔG° for the same reaction is – _____ $\times 10^{-1}$ kJ mol^{-1}.

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

Numerical value type: the answer is a number.

Answer: 57. · Key from source paper

Q64 JEE Main 2024 · 31 Jan · Shift 1 Numerical

Consider the following reaction at 298 K.

$\frac{3}{2}O_{2g} \rightleftharpoons O_{3g}$. $K_p = 2.47 \times 10^{-29}$

$\Delta_r G^0$ for the reaction is _____ kJ. (Given R = 8.314 J K^{-1} mol^{-1})

Round off your answer to the nearest integer.

Numerical value type: the answer is a number.

Answer: 163. · Key from source paper

Q65 JEE Main 2024 · 31 Jan · Shift 2 Numerical

If 5 moles of an ideal gas expands from 10L to a volume of 100L at 300K under isothermal and reversible condition then work, w, is $-x$ J. The value of x is - _____.
(Given R = 8.314 J K^{-1} mol^{-1})

Numerical value type: the answer is a number.

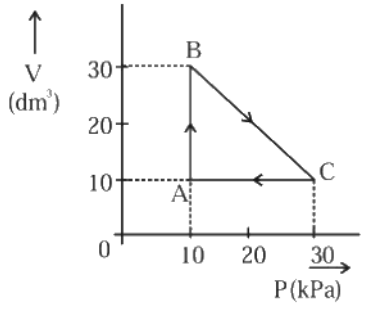
Answer: 28721. · Checked by our team

Q66 JEE Main 2024 · 30 Jan · Shift 1 Numerical

An ideal gas undergoes a cyclic transformation starting from the point A and coming back to the same point by tracing the path A → B → C → A as shown in the diagram. The total work done in the process is _____ J.

(see the figure above)

Q54. An ideal gas undergoes a cyclic transformation starting from the point A and coming back to the same point by tracing the path $A \rightarrow B \rightarrow C \rightarrow A$ as shown in the diagram. The total work done in the process is _____J.



Numerical value type: the answer is a number.

Answer: 200. · Key from source paper

Q67 JEE Main 2024 · 30 Jan · Shift 2 Numerical

Two reactions are given below:

$2Fe_{(s)} + \frac{3}{2}O_{2(g)} \rightarrow Fe_2O_{3(s)}, \Delta H^o = -822$ kJ / mol

$C_{(s)} + \frac{1}{2}O_{2(g)} \rightarrow CO_{(g)}, \Delta H^o = -110$ kJ / mol

Then enthalpy change for following reaction

$3C_{(s)} + Fe_2O_{3(s)} \rightarrow 2Fe_{(s)} + 3CO_{(g)}$

Numerical value type: the answer is a number.

Answer: 492. · Key from source paper

Q68 JEE Main 2024 · 29 Jan · Shift 1 MCQ

Which of the following is not correct?

(A) ΔG is negative for a spontaneous reaction
(B) ΔG is positive for a spontaneous reaction
(C) ΔG is zero for a reversible reaction
(D) ΔG is positive for a non-spontaneous reaction

Answer: (B) ΔG is positive for a spontaneous reaction · Key from source paper

Q69 JEE Main 2024 · 29 Jan · Shift 2 Numerical

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 $gmol^{-1}$; C = 12, Cl = 35.5)

Round off your answer to the nearest integer.

Numerical value type: the answer is a number.

Answer: 56. · Key from source paper

Q70 JEE Main 2024 · 27 Jan · Shift 1 Numerical

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

Numerical value type: the answer is a number.

Answer: 1200. · Key from source paper

Q71 JEE Main 2024 · 27 Jan · Shift 2 Numerical

For a certain thermochemical reaction M $\rightarrow$ N at T = 400 K, $\Delta H^\circ = 77.2$ kJ mol^{-1}, $\Delta S^\circ = 122$ J K^{-1}, log equilibrium constant ($\log K$) is - _____ $\times 10^{-1}$.

Numerical value type: the answer is a number.

Answer: 37. · Key from source paper

Q72 JEE Main 2023 · 15 Apr · Shift 1 Numerical

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

Numerical value type: the answer is a number.

Answer: 1070. · Key from source paper

Q73 JEE Main 2023 · 13 Apr · Shift 1 Numerical

$A_2 + B_2 \rightarrow 2\,AB$. $\Delta H_f = -200$ kJ mol^{-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 _____ kJ mol^{-1} (Nearest integer)

Numerical value type: the answer is a number.

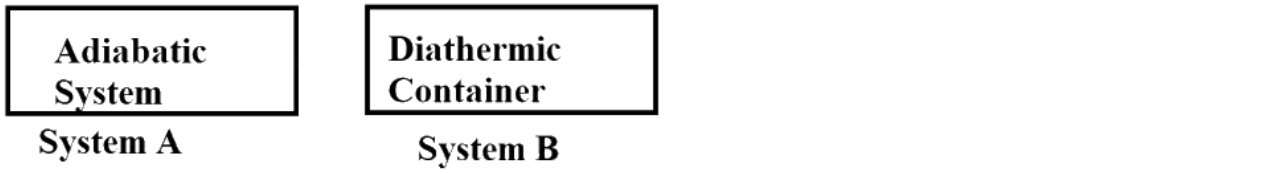
Answer: 800. · Key from source paper

Q74 JEE Main 2023 · 13 Apr · Shift 2 MCQ

What happens when methane undergoes combustion in systems A and B respectively?

(see the figure above)

Q34. What happens when methane undergoes combustion in systems A and B respectively?



(1) System A: Temperature rises; System B: Temperature remains same
(2) System A: Temperature remains same; System B: Temperature rises
(3) System A: Temperature falls; System B: Temperature remains same
(4) System A: Temperature falls; System B: Temperature rises

(A) System A: Temperature rises; System B: Temperature remains same
(B) System A: Temperature remains same; System B: Temperature rises
(C) System A: Temperature falls; System B: Temperature remains same
(D) System A: Temperature falls; System B: Temperature rises

Answer: (A) System A: Temperature rises; System B: Temperature remains same · Key from source paper

Q75 JEE Main 2023 · 11 Apr · Shift 1 Numerical

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 ΔH_f^0 $Al_2O_3 = -1700$ kJ mol^{-1}
ΔH_f^0 $Fe_2O_3 = -840$ kJ mol^{-1}
Molar mass of Fe, Al and O are 56, 27 and 16 g mol^{-1} respectively

Numerical value type: the answer is a number.

Answer: 4. · Key from source paper

Q76 JEE Main 2023 · 11 Apr · Shift 2 Numerical

The total number of intensive properties from the following is _____
Volume, Molar heat capacity, molarity, E^o_{cell}, Gibbs free energy change, Molar mass, Mole

Numerical value type: the answer is a number.

Answer: 4. · Key from source paper

Q77 JEE Main 2023 · 10 Apr · Shift 1 MCQ

Given

(A) $2\mathrm{CO g} + \mathrm{O_2 g} \rightarrow 2\mathrm{CO_2 g}\ \Delta H_1^{\circ} = -\mathrm{x\ kJ\ mol^{-1}}$

(B) $\mathrm{C graphite} + \mathrm{O_2 g} \rightarrow \mathrm{CO_2 g}\ \Delta H_2^{\circ} = -\mathrm{y\ kJ\ mol^{-1}}$

The ΔH° for the reaction $\mathrm{C graphite} + \frac{1}{2}\mathrm{O_2 g} \rightarrow \mathrm{CO g}$ is

(A) $\frac{2x-y}{2}$

(B) $\frac{x+2y}{2}$

(C) $\frac{x-2y}{2}$

(D) $2y - x$

Answer: (C) $\frac{x-2y}{2}$ · Key from source paper

Q78 JEE Main 2023 · 10 Apr · Shift 2 Numerical

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

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

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

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

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

E. Dissolution of ammonium chloride in water

Numerical value type: the answer is a number.

Answer: 4. · Key from source paper

Q79 JEE Main 2023 · 8 Apr · Shift 1 Numerical

When a 60 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 _____ $\mathrm{J\,K^{-1}}$ (Nearest integer)

Numerical value type: the answer is a number.

Answer: 1200. · Key from source paper

Q80 JEE Main 2023 · 8 Apr · Shift 2 Numerical

For complete combustion of ethene,

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

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

Given: $\mathrm{R} = 8.3\ \mathrm{J\,K^{-1}\ mol^{-1}}$

Numerical value type: the answer is a number.

Answer: 1411. · Key from source paper

Q81 JEE Main 2023 · 6 Apr · Shift 1 Numerical

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

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

$\Delta S^{\circ} = 10\ \mathrm{J\,K^{-1}\ mol^{-1}}$

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

Numerical value type: the answer is a number.

Answer: 10. · Key from source paper

Q82 JEE Main 2023 · 6 Apr · Shift 1 Numerical

Consider the graph of Gibbs free energy G vs extent of reaction. The number of statement/s from the following which are true with respect to points (a), (b) and (c) is _____

(see the figure above)

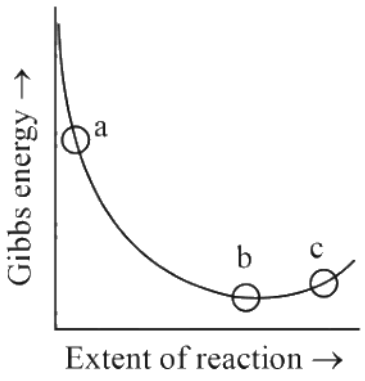
A. Reaction is spontaneous at (a) and (b)

B. Reaction is at equilibrium at point (b) and non-spontaneous at point (c)

C. Reaction is spontaneous at (a) and non-spontaneous at (c)

D. Reaction is non-spontaneous at (a) and (b)

Q55. Consider the graph of Gibbs free energy G vs extent of reaction. The number of statement/s from the following which are true with respect to points (a), (b) and (c) is _____



A. Reaction is spontaneous at (a) and (b)

B. Reaction is at equilibrium at point (b) and non-spontaneous at point (c)

C. Reaction is spontaneous at (a) and non-spontaneous at (c)

D. Reaction is non-spontaneous at (a) and (b)

Numerical value type: the answer is a number.

Answer: 2. · Key from source paper

Q83 JEE Main 2023 · 6 Apr · Shift 2 Numerical

Consider the following data

Heat of combustion of $H_2(g) = -241.8\ kJ\ mol^{-1}$

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

Heat of combustion of $C_2H_5OH(l) = -1234.7\ kJ\ mol^{-1}$

The heat of formation of $C_2H_5OH(l)$ is $(-)$ _____ $kJ\ mol^{-1}$ (Nearest integer).

Numerical value type: the answer is a number.

Answer: 278. · Key from source paper

Q84 JEE Main 2023 · 1 Feb · Shift 1 Numerical

At 25°C, the enthalpy of the following processes are given:
$H_2(g) + O_2(g) \rightarrow 2OH(g)$ ΔH^o = 78 $kJ\ mol^{-1}$
$H_2(g) + 1/2O_2(g) \rightarrow H_2O(g)$ ΔH^0 = - 242 $kJ\ mol^{-1}$
$H_2(g) \rightarrow 2H(g)$ ΔH^o = 436 $kJ\ mol^{-1}$
$1/2O_2(g) \rightarrow O(g)$ ΔH^0 = 249 $kJ\ mol^{-1}$
What would be the value of X for the following reaction? (Nearest integer)
$H_2O(g) \rightarrow H(g) + OH(g)$ ΔH^o = X $kJmol^{-1}$

Numerical value type: the answer is a number.

Answer: 499. · Key from source paper

Q85 JEE Main 2023 · 1 Feb · Shift 2 Numerical

1. 3 g of ethane undergoes combustion at 27°C in a bomb calorimeter. The temperature of calorimeter system (including the water) is found to rise by 0. 5°C. The heat evolved during combustion of ethane at constant pressure is _____ $kJmol^{-1}$. (Nearest integer)

[Given : The heat capacity of the calorimeter system is 20 $kJ\ K^{-1}$, R = 8. 3 $JK^{-1}\ mol^{-1}$.
Assume ideal gas behaviour.
Assume ideal gas behaviour.
Atomic mass of C and H are 12 and 1 $g\ mol^{-1}$ respectively]

Numerical value type: the answer is a number.

Answer: 1006. · Key from source paper

Q86 JEE Main 2023 · 31 Jan · Shift 1 Numerical

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

Given : $\Delta_{dis}H^0_{Cl_2(g)}$ = 240 $kJ\ mol^{-1}$.
$\Delta_{eg}H^0_{Cl(g)}$ = - 350 $kJ\ mol^{-1}$,

$\Delta_{hyd}H^{0}_{\mathrm{Cl(g)}}$ = - 380 kJ mol^{-1}

Numerical value type: the answer is a number.

Answer: 610. · Key from source paper

Q87 JEE Main 2023 · 31 Jan · Shift 2 Numerical

Enthalpies of formation of $\mathrm{CCl_4(g)}$, $\mathrm{H_2O(g)}$, $\mathrm{CO_2(g)}$ and HCl are -105, -242, -394 and -92 kJ mol $^{-1}$ respectively. The magnitude of enthalpy of the reaction given below is kJmol^{-1}. (nearest integer)
$\mathrm{CCl_4(g) + 2H_2O(g) \rightarrow CO_2(g) + 4\,HCl(g)}$

Numerical value type: the answer is a number.

Answer: 173. · Key from source paper

Q88 JEE Main 2023 · 30 Jan · Shift 1 Numerical

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 value type: the answer is a number.

Answer: 0. · Key from source paper

Q89 JEE Main 2023 · 30 Jan · Shift 2 Numerical

1 mole of ideal gas is allowed to expand reversibly and adiabatically from a temperature of 27°C. The work done is 3 kJ mol^{-1}. The final temperature of the gas is _____ K (Nearest integer). Given C_v = 20 J mol^{-1} K^{-1}

Numerical value type: the answer is a number.

Answer: 150. · Key from source paper

Q90 JEE Main 2023 · 29 Jan · Shift 1 Numerical

Consider the following reaction approaching equilibrium at $27^{\circ}\mathrm{C}$ and 1 atm pressure

$$\mathrm{A + B} \underset{K_r=10^2}{\overset{K_f=10^3}{\rightleftharpoons}} \mathrm{C + D}$$

The standard Gibbs's energy change ($\Delta_r G^{\circ}$) at $27^{\circ}\mathrm{C}$ is $(-)$ _____ $\mathrm{kJ\,mol^{-1}}$ (Nearest integer). (Given : R = $8.3\ \mathrm{J\,K^{-1}\,mol^{-1}}$ and $\ln 10 = 2.3$)

Numerical value type: the answer is a number.

Answer: 6. · Key from source paper

Q91 JEE Main 2023 · 29 Jan · Shift 2 MCQ

Which of the following relations are correct?
(A) $\mathrm{\Delta U = q + p\Delta V}$
(B) $\mathrm{\Delta G = \Delta H - T\Delta S}$

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

(D) $\Delta H = \Delta U - \Delta nRT$

Choose the most appropriate answer from the options given below :

(A) C and D only

(B) B and C only

(C) A and B only

(D) B and D only

Answer: (B) B and C only · Key from source paper

Q92 JEE Main 2023 · 25 Jan · Shift 1 Numerical

An athlete is given 100 g of glucose ($C_6H_{12}O_6$) for energy. This is equivalent to 1800 kJ 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 mol^{-1}
Molar mass of C, H&O are 12.1 and 16 g mol^{-1}.

Numerical value type: the answer is a number.

Answer: 360. · Key from source paper

Q93 JEE Main 2023 · 25 Jan · Shift 2 Numerical

28.0 L of CO_2 is produced on complete combustion of 16.8 L gaseous mixture of ethene and methane at $25^{\circ}C$ and 1 atm. Heat evolved during the combustion process is kJ

Given: $\Delta H_C(CH_4) = -900\ kJ\ mol^{-1}$

$\Delta H_C(C_2H_4) = -1400\ kJ\ mol^{-1}$.

Numerical value type: the answer is a number.

Answer: 847. · Key from source paper

Q94 JEE Main 2023 · 24 Jan · Shift 1 Numerical

For independent process at 300 K.

Process	ΔH / kJ mol^{-1}	ΔS / J K^{-1}
A	-25	-80
B	-22	40
C	25	-50
D	22	20

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

Numerical value type: the answer is a number.

Answer: 2. · Key from source paper

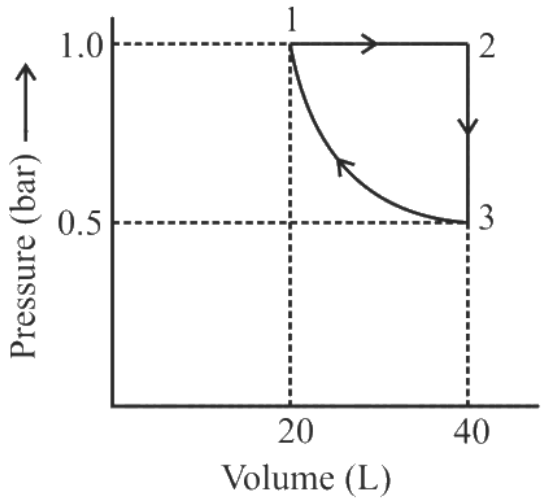
Q95 JEE Main 2023 · 24 Jan · Shift 2 Numerical

One mole of an ideal monoatomic gas is subjected to changes as shown in the graph. The magnitude of the work done (by the system or on the system) is _____ J (nearest integer)

(see the figure above)

Given : $\log 2 = 0.3$, $\ln 10 = 2.3$

Q35. One mole of an ideal monoatomic gas is subjected to changes as shown in the graph. The magnitude of the work done (by the system or on the system) is _____ J (nearest integer)



Given : log 2 = 0.3, ln 10 = 2.3

Numerical value type: the answer is a number.

Answer: 620. · Key from source paper

Q96 JEE Main 2022 · 29 Jul · Shift 1 Numerical

When 600 mL of 0.2 M HNO_3 is mixed with 400 mL of 0.1 M NaOH solution in a flask, the rise in temperature of the flask is _____ $\times 10^{-2}$ °C
(Enthalpy of neutralisation = 57 kJ mol^{-1} and Specific heat of water = 4.2 JK^{-1} g^{-1}) (Neglect heat capacity of flask)

Numerical value type: the answer is a number.

Answer: 54. · Key from source paper

Q97 JEE Main 2022 · 29 Jul · Shift 2 MCQ

$C(s) + O_2(g) \rightarrow CO_2(g) + 400$ kJ
$C(s) + \frac{1}{2}O_2(g) \rightarrow CO(g) + 100$ 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 'CO_2'.
The heat generated when 0.6 kg of coal is burnt is

(A) 1600 kJ
(B) 3200 kJ
(C) 4400 kJ
(D) 6600 kJ

Answer: (D) 6600 kJ · Key from source paper

Q98 JEE Main 2022 · 28 Jul · Shift 1 MCQ

Which of the following relation is not correct?

(A) $\Delta H = \Delta U - P\Delta V$
(B) $\Delta U = q + W$
(C) $\Delta S_{sys} + \Delta S_{surr} \geq 0$
(D) $\Delta G = \Delta H - T\Delta S$

Answer: (A) $\Delta H = \Delta U - P\Delta V$ · Key from source paper

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Q99 JEE Main 2022 · 28 Jul · Shift 2 Numerical

Among the following the number of state variable is
Internal energy (U)
Volume (V)
Heat (q)
Enthalpy (H)

Numerical value type: the answer is a number.

Answer: 3. · Key from source paper

Q100 JEE Main 2022 · 27 Jul · Shift 1 Numerical

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

Numerical value type: the answer is a number.

Answer: 2. · Key from source paper

Q101 JEE Main 2022 · 27 Jul · Shift 2 Numerical

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

Numerical value type: the answer is a number.

Answer: 35. · Key from source paper

Q102 JEE Main 2022 · 26 Jul · Shift 1 Numerical

2.4 g coal is burnt in a bomb calorimeter in excess of oxygen at 298 K and 1 atm pressure. The temperature of the calorimeter rises from 298 K to 300 K. The enthalpy change during the combustion of coal is $-$x kJ mol^{-1}. The value of x is _____ (Given : Heat capacity of bomb calorimeter 20.0 kJK^{-1}. Assume coal to be pure carbon)

Numerical value type: the answer is a number.

Answer: 200. · Key from source paper

Q103 JEE Main 2022 · 26 Jul · Shift 2 Numerical

For the reaction $\mathrm{H_2F_2g} \rightarrow \mathrm{H_2g} + \mathrm{F_2g}$
$\Delta U = -59.6\ \mathrm{kJ\ mol^{-1}}$ at 27 °C
The enthalpy change for the above reaction is - _____ $\mathrm{kJmol^{-1}}$ (nearest integer)
(Given : R = $8.314\mathrm{JK^{-1}\ mol^{-1}}$).

Numerical value type: the answer is a number.

Answer: 57. · Key from source paper

Q104 JEE Main 2022 · 25 Jul · Shift 1 Numerical

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

Numerical value type: the answer is a number.

Answer: 104. · Key from source paper

Q105 JEE Main 2022 · 25 Jul · Shift 2 Numerical

While performing a thermodynamics experiment, a student made the following observations,
$\mathrm{HCl + NaOH \rightarrow NaCl + H_2O}\ \Delta H = -57.3\ \mathrm{kJ\,mol^{-1}}$
$\mathrm{CH_3COOH + NaOH \rightarrow CH_3COONa + H_2O}\ \Delta H = -55.3\ \mathrm{kJ\,mol^{-1}}$.
The enthalpy of ionization of $\mathrm{CH_3COOH}$ as calculated by the student is $\mathrm{kJ\ mol^{-1}}$.

Numerical value type: the answer is a number.

Answer: 2. · Key from source paper

Q106 JEE Main 2022 · 29 Jun · Shift 1 Numerical

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

Numerical value type: the answer is a number.

Answer: 117. · Key from source paper

Q107 JEE Main 2022 · 29 Jun · Shift 2 Numerical

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 JK^{-1} mol^{-1})

Numerical value type: the answer is a number.

Answer: 195. · Checked by our team

Q108 JEE Main 2022 · 28 Jun · Shift 1 Numerical

4.0 L of an ideal gas is allowed to expand isothermally into vacuum until the total volume is 20 L. The amount of heat absorbed in this expansion is _____ L atm.

Numerical value type: the answer is a number.

Answer: 0. · Key from source paper

Q109 JEE Main 2022 · 28 Jun · Shift 2 Numerical

For combustion of one mole of magnesium in an open container at 300 K and 1 bar pressure, $\Delta_C H^{\ominus} = -601.70$ 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 value type: the answer is a number.

Answer: 600. · Key from source paper

Q110 JEE Main 2022 · 27 Jun · Shift 1 MCQ

Match List - I with List - II.
List-I
(A) Spontaneous process
(B) Process with $\Delta P = 0, \Delta T = 0$
(C) $\Delta H_{reaction}$
(D) Exothermic Process
List-II
(I) $\Delta H < 0$
(II) $\Delta G_{T,P} < 0$
(III) Isothermal and isobaric process

(IV) [Bond energies of molecules in reactants] - [Bond energies of product molecules]
Choose the correct answer from the options given below

(A) (A) − (III), (B) − (II), (C) − (IV), (D) − (I)
(B) (A) − (II), (B) − (III), (C) − (IV), (D) − (I)
(C) (A) − (II), (B) − (III), (C) − (I), (D) − (IV)
(D) (A) − (II), (B) − (I), (C) − (III), (D) − (IV)

Answer: (B) (A) − (II), (B) − (III), (C) − (IV), (D) − (I) · Key from source paper

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Q111 JEE Main 2022 · 27 Jun · Shift 2 Numerical

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

Numerical value type: the answer is a number.

Answer: 8630. · Key from source paper

Q112 JEE Main 2022 · 26 Jun · Shift 1 Numerical

For complete combustion of methanol
$\mathrm{CH_3OH(l) + \frac{3}{2}O_2(g) \rightarrow CO_2(g) + 2H_2O(l)}$ the amount of heat produced as measured by bomb calorimeter is $726\ \mathrm{kJ\ mol^{-1}}$ at $27^{\circ}\mathrm{C}$. The enthalpy of combustion for the reaction is $-x\ \mathrm{kJ\ mol^{-1}}$, where x is
integer)
(Given : $\mathrm{R} = 8.3\ \mathrm{JK^{-1}\ mol^{-1}}$)

Numerical value type: the answer is a number.

Answer: 727. · Key from source paper

Q113 JEE Main 2022 · 26 Jun · Shift 2 Numerical

A fish swimming in water body when taken out from the water body is covered with a film of water of weight $36\ \mathrm{g}$. When it is subjected to cooking at $100^{\circ}\mathrm{C}$, then the internal energy for vaporization in $\mathrm{kJmol^{-1}}$ is
integer]
[Assume steam to be an ideal gas. Given $\Delta_{\mathrm{vap}}H^{\ominus}$ for water at $373\ \mathrm{K}$ and $1\ \mathrm{bar}$ is $41.1\ \mathrm{kJ\ mol^{-1}}$: $\mathrm{R} = 8.31\ \mathrm{J\ K^{-1}\ mol^{-1}}$]

Numerical value type: the answer is a number.

Answer: 38. · Key from source paper

Q114 JEE Main 2022 · 25 Jun · Shift 1 Numerical

The standard entropy change for the reaction
$\mathrm{4Fes + 3O_2g \rightarrow 2Fe_2O_3s}$ is $-550\ \mathrm{J\ K^{-1}}$ at $298\ \mathrm{K}$

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

Numerical value type: the answer is a number.

Answer: 300. · Key from source paper

Q115 JEE Main 2022 · 25 Jun · Shift 2 MCQ

At 25°C and $1\ \text{atm}$ pressure, the enthalpy of combustion of benzene 1 and acetylene g are $-3268\ \text{kJ mol}^{-1}$ and $-1300\ \text{kJ mol}^{-1}$, respectively. The change in enthalpy for the reaction $3\text{C}_2\text{H}_2\text{g} \rightarrow \text{C}_6\text{H}_6\text{l}$, is

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

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

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

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

Answer: (C) $-632\ \text{kJ mol}^{-1}$ · Key from source paper

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Q116 JEE Main 2022 · 24 Jun · Shift 2 MCQ

At 25°C and $1\ \text{atm}$ pressure, the enthalpies of combustion are as given below:

Substance	H_2	C (graphite)	$\text{C}_2\text{H}_6(\text{g})$
$\frac{\Delta_c H^{\ominus}}{\text{kJ mol}^{-1}}$	-286.0	-394.0	-1560.0

The enthalpy of formation of ethane is

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

(B) $-68.0\ \text{kJ mol}^{-1}$

(C) $-86.0\ \text{kJ mol}^{-1}$

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

Answer: (C) $-86.0\ \text{kJ mol}^{-1}$ · Key from source paper

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Q117 JEE Main 2021 · 1 Sep · Shift 2 Numerical

For the reaction $2\text{NO}_2(g) \rightleftharpoons \text{N}_2\text{O}_4(g)$, when $\Delta\text{S} = -176.0\ \text{J K}^{-1}$ and $\Delta\text{H} = -57.8\ \text{kJ mol}^{-1}$ the magnitude of ΔG at 298 K for the reaction is _____ kJmol^{-1}. (Nearest integer)

Numerical value type: the answer is a number.

Answer: 5. · Key from source paper

Q118 JEE Main 2021 · 31 Aug · Shift 2 MCQ

The incorrect expression among the following is :

(A) For isothermal process $w_{\text{reversible}} = -nRT \ln \frac{V_f}{V_i}$

(B) $\ln K = \frac{\Delta H^\circ - T\Delta S^\circ}{RT}$

(C) $\frac{\Delta G_{\text{System}}}{\Delta S_{\text{Total}}} = -T$ (at constant P)

(D) $K = e^{-\Delta G^\circ / RT}$

Answer: (B) $\ln K = \frac{\Delta H^\circ - T\Delta S^\circ}{RT}$ · Key from source paper

Q119 JEE Main 2021 · 27 Aug · Shift 1 Numerical

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 value type: the answer is a number.

Answer: 82. · Key from source paper

Q120 JEE Main 2021 · 27 Aug · Shift 2 Numerical

Data given for the following reaction is as follows :

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

Table with columns Substance, $\Delta_f \mathrm{H}^\circ$ $(\mathrm{kJmol^{-1}})$ and ΔS° $(\mathrm{Jmol^{-1}\,K^{-1}})$:

$\mathrm{FeO_{(s)}}$: -266.3, 57.49

$\mathrm{C_{(graphite)}}$: 0, 5.74

$\mathrm{Fe_{(s)}}$: 0, 27.28

$\mathrm{CO_{(g)}}$: -110.5, 197.6

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

Numerical value type: the answer is a number.

Answer: 964. · Key from source paper

Q121 JEE Main 2021 · 26 Aug · Shift 2 Numerical

For water $\Delta_{\text{vap}}\mathrm{H} = 41\ \mathrm{kJ\ mol^{-1}}$ at $373\ \mathrm{K}$ 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 $(\mathrm{kJmol^{-1}})$:

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

Numerical value type: the answer is a number.

Answer: 38. · Key from source paper

Q122 JEE Main 2021 · 27 Jul · Shift 1 Numerical

For water at $100^{\circ}C$ and 1 bar,
$\Delta_{vap}H - \Delta_{vap}U$ = _____ $\times 10^2$ 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 value type: the answer is a number.

Answer: 31. · Key from source paper

Q123 JEE Main 2021 · 27 Jul · Shift 2 Numerical

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 :$H^+(aq) + OH^-(aq) \rightarrow H_2O : \Delta_rH = -57.1$ 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 value type: the answer is a number.

Answer: 82. · Key from source paper

Q124 JEE Main 2021 · 25 Jul · Shift 1 Numerical

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 value type: the answer is a number.

Answer: 101. · Key from source paper

Q125 JEE Main 2021 · 25 Jul · Shift 2 Numerical

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 value type: the answer is a number.

Answer: 50. · Key from source paper

Q126 JEE Main 2021 · 22 Jul · Shift 1 Numerical

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 in kJ (Nearest integer):

Numerical value type: the answer is a number.

Answer: 21. · Key from source paper

Q127 JEE Main 2021 · 20 Jul · Shift 1 Numerical

An average person needs about $10000\ \mathrm{kJ}$ energy per day. The amount of glucose (molar mass $= 180.0\ \mathrm{g\ mol^{-1}}$) needed to meet this energy requirement is _____g.
(Use : $\Delta_c H$ (glucose)$= -2700\ \mathrm{kJ\ mol^{-1}}$)

Numerical value type: the answer is a number.

Answer: 667. · Key from source paper

Q128 JEE Main 2021 · 20 Jul · Shift 2 Numerical

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

Numerical value type: the answer is a number.

Answer: 336. · Key from source paper

Q129 JEE Main 2021 · 18 Mar · Shift 1 Numerical

For the reaction
$\mathrm{C_2H_6 \rightarrow C_2H_4 + H_2}$
the reaction enthalpy $\Delta_r H$ in $\mathrm{kJmol^{-1}}$ is
(Round off to the Nearest Integer).
[Given : Bond enthalpies in $\mathrm{kJmol^{-1}}$: C $-$ C : 347, C = C : 611; C $-$ H : 414, H $-$ H : 436]

Numerical value type: the answer is a number.

Answer: 128. · Key from source paper

Q130 JEE Main 2021 · 17 Mar · Shift 1 Numerical

The standard enthalpies of formation of $\mathrm{Al_2O_3}$ and CaO are $-1675\ \mathrm{kJ\ mol^{-1}}$ and $-635\ \mathrm{kJ\ mol^{-1}}$ respectively.
For the reaction
$\mathrm{3CaO + 2Al \rightarrow 3Ca + Al_2O_3}$ the standard reaction enthalpy $\Delta_r \mathrm{H^0} =$ _____ kJ. (Round off to the Nearest Integer).

Numerical value type: the answer is a number.

Answer: 230. · Key from source paper

Q131 JEE Main 2021 · 17 Mar · Shift 2 MCQ

During which of the following processes, does entropy decrease ?
(A) Freezing of water to ice at $0^\circ\mathrm{C}$
(B) Freezing of water to ice at $-10^\circ\mathrm{C}$
(C) $\mathrm{N_2(\ g) + 3H_2(\ g) \rightarrow 2NH_3(\ g)}$
(D) Adsorption of $\mathrm{CO(g)}$ and lead surface
(E) Dissolution of NaCl in water

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

Answer: (A) (A), (B),(C) and (D) only · Key from source paper

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Q132 JEE Main 2021 · 16 Mar · Shift 1 Numerical

For the reaction $\mathrm{A(g)} \rightleftharpoons \mathrm{B(g)}$ at $495\ \mathrm{K}$, $\Delta_r G^\circ = -9.478\ \mathrm{kJ\ mol^{-1}}$
If we start the reaction in a closed container at 495 K with 22 millimoles of A, the amount of B is the equilibrium mixture is _____ millimoles. (Round off to the Nearest Integer).
[$\mathrm{R} = 8.314\ \mathrm{J\ mol^{-1}\ K^{-1}}; \ell\mathrm{n}10 = 2.303$]

Numerical value type: the answer is a number.

Answer: 20. · Key from source paper

Q133 JEE Main 2021 · 16 Mar · Shift 2 Numerical

At $25^\circ\mathrm{C}$, $50\ \mathrm{g}$ of iron reacts with HCl to form $\mathrm{FeCl_2}$. The evolved hydrogen gas expands against a constant pressure of $1\ \mathrm{bar}$. The work done by the gas during this expansion is $-$_____ J. (Round off to the Nearest Integer)
[Given : R = $8.314\ \mathrm{J\ mol^{-1}\ K^{-1}}$. Assume, hydrogen is an ideal gas]
[Atomic mass off Fe is $55.85\ \mathrm{u}$]

Numerical value type: the answer is a number.

Answer: 2218. · Key from source paper

Q134 JEE Main 2021 · 26 Feb · Shift 1 Numerical

For a chemical reaction $\mathrm{A + B = C + D}$ ($\Delta_r H^\ominus = 80\ \mathrm{kJ\ mol^{-1}}$) the entropy change $\Delta_r S^\ominus$ depends on the temperature T (in K) as $\Delta_r S^\ominus = 2T\ (\mathrm{JK^{-1}\ mol^{-1}})$. Minimum temperature at which it will become spontaneous is _____ K. (Integer)

Numerical value type: the answer is a number.

Answer: 200. · Key from source paper

Q135 JEE Main 2021 · 26 Feb · Shift 2 Numerical

The average S $-$ F bond energy in $\mathrm{kJ\ mol^{-1}}$ of $\mathrm{SF_6}$ is _____. (Rounded off to the nearest integer)
[Given : The values of standard enthalpy of formation of $\mathrm{SF_6(g)}$, $\mathrm{S(g)}$ and $\mathrm{F(g)}$ are -1100, 275 and $80\ \mathrm{kJ\ mol^{-1}}$ respectively.]

Numerical value type: the answer is a number.

Answer: 309. · Key from source paper

Q136 JEE Main 2021 · 25 Feb · Shift 1 Numerical

The reaction of cyanamide, $\mathrm{NH_2\,CN_{(s)}}$ with oxygen was run in a bomb calorimeter and ΔU was found to be $-742.24\ \mathrm{kJ\ mol^{-1}}$. The magnitude of ΔH_{298} for the reaction
$\mathrm{NH_2\,CN_{(s)} + \frac{3}{2}O_{2(g)} \rightarrow N_{2(g)} + O_{2(g)} + H_2O_{(l)}}$ is kJ. (Rounded off to the nearest integer) [Assume ideal gases and $\mathrm{R = 8.314\ J\ mol^{-1}\ K^{-1}}$]

Numerical value type: the answer is a number.

Answer: 741. · Key from source paper

Q137 JEE Main 2021 · 25 Feb · Shift 2 Numerical

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

Numerical value type: the answer is a number.

Answer: 3. · Key from source paper

Q138 JEE Main 2021 · 24 Feb · Shift 1 Numerical

For the reaction $\mathrm{A_g \rightarrow B_g}$, the value of the equilibrium constant at $300\ \mathrm{K}$ and 1 atm is equal to 100.0. The value of ΔG° for the reaction at $300\ \mathrm{K}$ and 1 atm in $\mathrm{J\,mol^{-1}}$ is $-x\mathrm{R}$, where x is (Rounded off to the nearest integer) $\mathrm{R = 8.31\ J\ mol^{-1}\ K^{-1}}$ and $\ln 10 = 2.3$

Numerical value type: the answer is a number.

Answer: 1380. · Key from source paper

Q139 JEE Main 2021 · 24 Feb · Shift 2 Numerical

Assuming ideal behaviour, the magnitude of $\log \mathrm{K}$ for the following reaction at $25^\circ\mathrm{C}$ is $\mathrm{x \times 10^{-1}}$. The value of x is _____. (Integer answer)
$\mathrm{3HC \equiv CH_{(g)} \rightleftharpoons C_6H_{6(l)}}$
[Given:
$\mathrm{\Delta_f G^\circ(HC \equiv CH) = -2.04 \times 10^5\ J\ mol^{-1}}$; $\mathrm{\Delta_f G^\circ(C_6H_6) = -1.24 \times 10^5\ J\ mol^{-1}}$; $\mathrm{R = 8.314\ J\ K^{-1}\ mol^{-1}}$
]

Numerical value type: the answer is a number.

Answer: 855. · Key from source paper

Q140 JEE Main 2020 · 5 Sep · Shift 2 MCQ

Lattice enthalpy and enthalpy of solution of $NaCl$ are 788 $\mathrm{kJmol^{-1}}$and $4kJmol^{-1}$, respectively. The hydration enthalpy of $NaCl$ is:

(A) $-780\ \mathrm{kJmol^{-1}}$
(B) $780\ \mathrm{kJmol^{-1}}$
(C) $-784\ \mathrm{kJmol^{-1}}$
(D) $784\ \mathrm{kJmol^{-1}}$

Answer: (C) $-784\ \mathrm{kJmol^{-1}}$ · Key from source paper

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Q141 JEE Main 2020 · 5 Sep · Shift 2 Numerical

For a dimerization reaction,
2A(g) $\rightarrow$ A_2(g)
at 298K, $\Delta U^{\ominus}$ = $-20\ \mathrm{kJmol^{-1}}$, $\Delta S^{\ominus}$ = $-30\ \mathrm{JK^{-1}mol^{-1}}$,then the $\Delta G^{\ominus}$ will be _____J.

Numerical value type: the answer is a number.

Answer: -13538. · Checked by our team

Q142 JEE Main 2020 · 4 Sep · Shift 1 MCQ

For one mole of an ideal gas, which of these statements must be true?
(a) Internal energy (U) and enthalpy (H) each depends on temperature.
(b) Compressibility factor Z is not equal to 1
(c) $\mathrm{C_{P,m} - C_{V,m} = R}$
(d) $\mathrm{dU = C_v\ dT}$ for any process

(A) (a) and (c)
(B) (b), (c) and (d)
(C) (c) and (d)
(D) (a), (c) and (d)

Answer: (D) (a), (c) and (d) · Key from source paper

Q143 JEE Main 2020 · 4 Sep · Shift 2 MCQ

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) $\mathrm{C_v(T_2 - T_1)}$
(B) $\mathrm{-RT(V_2 - V_1)}$
(C) $\mathrm{-RT\ ln\ V_2/V_1}$
(D) Zero

Answer: (D) Zero · Key from source paper

Q144 JEE Main 2020 · 2 Sep · Shift 1 Numerical

The internal energy change (in J) when 90 g of water undergoes complete evaporation at $100^{\circ}\mathrm{C}$ is .....

(Given : ΔH_{vap} for water at 373 K $= 41$ kJ / mol, $R = 8.314\ JK^{-1}\ mol^{-1}$)

Numerical value type: the answer is a number.

Answer: 189494. · Key from source paper

Q145 JEE Main 2020 · 2 Sep · Shift 2 Numerical

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

Numerical value type: the answer is a number.

Answer: 326400. · Key from source paper

Q146 JEE Main 2020 · 9 Jan · Shift 1 MCQ

If enthalpy of atomization for Br_2(l) is x kJ/mol and bond enthalpy for Br_2 is y kJ/mol, the relation between them

(A) is x = y.
(B) does not exist.
(C) is x > y.
(D) is x < y.

Answer: (C) is x > y. · Key from source paper

Q147 JEE Main 2020 · 9 Jan · Shift 2 MCQ

The true statement amongst the following is:

(A) Both ΔS and S are functions of temperature.
(B) Both S and ΔS are not functions of temperature
(C) S is not a function of temperature but ΔS is a function of temperature
(D) S is a function of temperature but ΔS is not a function of temperature

Answer: (A) Both ΔS and S are functions of temperature. · Key from source paper

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Q148 JEE Main 2020 · 8 Jan · Shift 2 Numerical

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

Numerical value type: the answer is a number.

Answer: 6.25. · Key from source paper

Q149 JEE Main 2020 · 7 Jan · Shift 1 Numerical

For the reaction;
$A(l) \rightarrow 2B(g)$

$\Delta U = 2.1\text{kcal}$, $\Delta S = 20\text{calK}^{-1}$ at 300K.
Hence ΔG in kcal is _____ .

Numerical value type: the answer is a number.

Answer: -2.7. · Key from source paper

Q150 JEE Main 2020 · 7 Jan · Shift 2 Numerical

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

Numerical value type: the answer is a number.

Answer: -192. · Key from source paper

Q151 JEE Main 2019 · 12 Apr · Shift 1 MCQ

An ideal gas is allowed to expand from 1 L to 10 L against a constant external pressure of 1 bar. The work done in kJ is:

(A) +10.0
(B) -2.0
(C) -0.9
(D) -9.0

Answer: (C) -0.9 · Key from source paper

Q152 JEE Main 2019 · 12 Apr · Shift 1 MCQ

Enthalpy of sublimation of iodine is $24\ \text{cal g}^{-1}$ at 200°C . If specific heat of I_2 (s) and I_2 (vap) are 0.055 and $0.031\ \text{cal g}^{-1}\text{K}^{-1}$ respectively, then enthalpy of sublimation of iodine at 250°C in cal g^{-1} is:

(A) 11.4
(B) 2.85
(C) 22.8
(D) 5.7

Answer: (C) 22.8 · Key from source paper

Q153 JEE Main 2019 · 12 Apr · Shift 2 MCQ

The incorrect match in the following is:

(A) $\Delta\text{G}^0 < 0, \text{K} > 1$
(B) $\Delta\text{G}^0 > 0, \text{K} < 1$
(C) $\Delta\text{G}^0 = 0, \text{K} = 1$
(D) $\Delta\text{G}^0 < 0, \text{K} < 1$

Answer: (D) $\Delta\text{G}^0 < 0, \text{K} < 1$ · Key from source paper

EdLoop JEE

Q154 JEE Main 2019 · 10 Apr · Shift 1 MCQ

A process will be spontaneous at all temperatures if:

(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: (B) $\Delta H < 0$ and $\Delta S > 0$ · Key from source paper

Q155 JEE Main 2019 · 10 Apr · Shift 2 MCQ

The difference between ΔH and ΔU is $\Delta H - \Delta U$, when the combustion of one mole of heptane l is carried out at a temperature T , is equal to:

(A) $-4RT$
(B) $3RT$
(C) $4RT$
(D) $-3RT$

Answer: (A) $-4RT$ · Key from source paper

Q156 JEE Main 2019 · 9 Apr · Shift 1 MCQ

Among the following, the set of parameters that represents path functions, is:
i) q + w
ii) q
iii) w
iv) H $-$ TS

(A) (ii) and (iii)
(B) (i), (ii), and (iii)
(C) (ii), (iii) and (iv)
(D) (i) and (iv)

Answer: (A) (ii) and (iii) · Key from source paper

Q157 JEE Main 2019 · 9 Apr · Shift 2 MCQ

During compression of a spring the work done is 10 kJ and 2 kJ escaped to the surroundings as heat. The change in internal energy, ΔU(in kJ) is:

EdLoop JEE

(A) -8
(B) 8
(C) 12
(D) -12

Answer: (B) 8 · Key from source paper

Q158 JEE Main 2019 · 8 Apr · Shift 1 MCQ

Which one of the following equations does not correctly represent the first law of thermodynamics for the given processes involving an ideal gas? (Assume non- expansion work is zero)

(A) Isochoric process : $\Delta U = q$
(B) Isochoric process : $q = -w$
(C) Cyclic process : $q = -w$
(D) Adiabatic process : $\Delta U = -w$

Options (4) or (2) were accepted. More than one answer was accepted. · Key from source paper

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Q159 JEE Main 2019 · 8 Apr · Shift 1 MCQ

For silver, $C_p\ (JK^{-1}mol^{-1}) = 23 + 0.01T$. If the temperature T of 3 moles of silver is raised from 300 K to 1000 K at 1 atm pressure, the value of ΔH will be close to:

(A) 16 kJ
(B) 62 kJ
(C) 13 kJ
(D) 21 kJ

Answer: (B) 62 kJ · Key from source paper

Q160 JEE Main 2019 · 8 Apr · Shift 2 MCQ

5 moles of an ideal gas at 100 K are allowed to undergo reversible compression till its temperature becomes 200 K. If C_V = 28 J K^{-1}, calculate ΔU and ΔpV for the process. (R = 8.0 J K^{-1} mol^{-1})

(A) ΔU = 14 J; ΔpV = 0.8 J
(B) ΔU = 14 kJ; ΔpV = 18 kJ
(C) ΔU = 14 kJ; ΔpV = 4 kJ
(D) ΔU = 2.8 kJ; ΔpV = 0.8 kJ

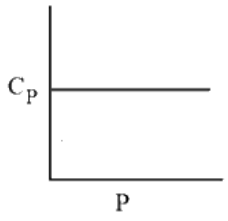
Answer: (C) ΔU = 14 kJ; ΔpV = 4 kJ · Key from source paper

Q161 JEE Main 2019 · 12 Jan · Shift 1 MCQ

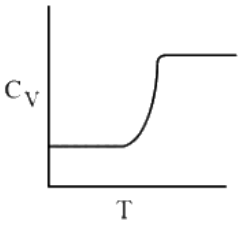
For a diatomic ideal gas in a closed system, which of the following plots does not correctly describe the relation between various thermodynamic quantities?

Q35. For a diatomic ideal gas in a closed system, which of the following plots does not correctly describe the relation between various thermodynamic quantities?

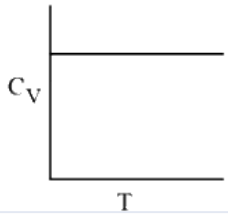
(1)



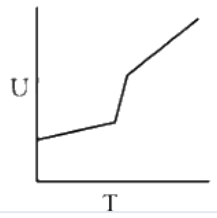
(2)



(3)



(4)



(A) *see figure*

(B) *see figure*

(C) *see figure*

(D) *see figure*

Answer: (C) · Key from source paper

Q162 JEE Main 2019 · 12 Jan · Shift 2 MCQ

Given:

(i) C(graphite) + $O_2(g) \rightarrow CO_2(g)$; $\Delta_r H^{\ominus}$ = x kJ mol^{-1}

(ii) C(graphite) + $\frac{1}{2}O_2(g) \rightarrow CO(g)$; $\Delta_r H^{\ominus}$ = y kJ mol^{-1}

(iii) CO(g) + $\frac{1}{2}O_2(g) \rightarrow CO_2(g)$; $\Delta_r H^{\ominus}$ = z kJ mol^{-1}

Based on the above thermochemical equations, find out which one of the following algebraic relationships is correct?

(A) x = y + z

(B) z = x + y

(C) y = 2z − x

(D) x = y − z

Answer: (A) x = y + z · Key from source paper

Q163 JEE Main 2019 · 11 Jan · Shift 1 MCQ

Two blocks of the same metal having same mass and at temperature T_1, and T_2, respectively, are brought in contact with each other and allowed to attain thermal equilibrium at constant pressure. The change in entropy, ΔS, for this process is :

(A) $C_P \ln \left[\frac{(T_1+T_2)^2}{4T_1T_2}\right]$

(B) $2C_p \ln \left[\frac{(T_1+T_2)^{\frac{1}{2}}}{T_1T_2}\right]$

(C) $2C_P \ln \left(\frac{T_1+T_2}{4T_1T_2}\right)$

(D) $2C_P \ln \left[\frac{T_1+T_2}{2T_1T_2}\right]$

Answer: (A) $C_P \ln \left[\frac{(T_1+T_2)^2}{4T_1T_2}\right]$ · Key from source paper

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Q164 JEE Main 2019 · 11 Jan · Shift 1 MCQ

For the chemical reaction X $\rightleftharpoons$ Y, the standard reaction Gibbs energy depends on temperature T (in K) as $\Delta_r G^\circ$ (in kJmol^{-1}) = 120 $-\frac{3}{8}$ T The major component of the reaction mixture at T is :

(A) Y if T = 300K

(B) Y if T = 280 K

(C) X if T = 350 K

(D) X if T = 315K

Answer: (D) X if T = 315K · Key from source paper

Q165 JEE Main 2019 · 11 Jan · Shift 2 MCQ

The reaction MgO(s) + C(s) $\rightarrow$ Mg(s) + CO(g), for which ΔH° = +491.1 kJ mol^{-1} and ΔS° = 198.0JK^{-1} mol^{-1} is not feasible at 298 K. Temperature above which reaction will be feasible is

(A) 2040.5 K

(B) 1890.0 K

(C) 2480.3 K

(D) 2380.5 K

Answer: (C) 2480.3 K · Key from source paper

Q166 JEE Main 2019 · 11 Jan · Shift 2 MCQ

The standard reaction Gibbs energy for a chemical reaction at an absolute temperature T is given by ΔG° = A $-$ BT where A and B are non-zero constants. Which of the following is true about this reaction?

(A) Exothermic if $B < 0$

(B) Endothermic if A > 0

(C) Endothermic if A < 0 and B > 0

(D) Exothermic if A > 0 and B < 0

Answer: (B) Endothermic if A > 0 · Key from source paper

Q167 JEE Main 2019 · 11 Jan · Shift 2 MCQ

For the equilibrium $2H_2O \rightleftharpoons H_3O^+ + OH^-$; the value of ΔG° at 298 K is approximately:

(A) 100 kJ mol^{-1}
(B) -80 kJ mol^{-1}
(C) 80 kJ mol^{-1}
(D) -100 kJ mol^{-1}

Answer: (C) 80 kJ mol^{-1} · Key from source paper

Q168 JEE Main 2019 · 10 Jan · Shift 1 MCQ

A process has $\Delta H = 200\ J\ mol^{-1}$ and $\Delta S = 40\ JK^{-1}mol^{-1}$. Out of the values given below choose the minimum temperature above which the process will be spontaneous:

(A) 20 K
(B) $5K$
(C) $12K$
(D) $4K$

Answer: (B) $5K$ · Key from source paper

Q169 JEE Main 2019 · 10 Jan · Shift 2 MCQ

The process with negative entropy change is:

(A) Synthesis of ammonia from N_2 and H_2.
(B) Dissolution of iodine in water.
(C) Dissociation of $CaSO_4$ (s) to CaO (s) and SO_3 (g).
(D) Sublimation of dry ice.

Answer: (A) Synthesis of ammonia from N_2 and H_2. · Key from source paper

Q170 JEE Main 2019 · 10 Jan · Shift 2 MCQ

An ideal gas undergoes isothermal compression from $5\ m^3$ to $1\ m^3$ against a constant external pressure of $4\ N\ m^{-2}$. The heat released in this process is $24\ J\ mol^{-1}K^{-1}$ and is used to increase the pressure of 1 mole of Al. The temperature of Al increases by:

(A) $\frac{2}{3}$ K
(B) 1 K
(C) $\frac{3}{2}$ K
(D) 2 K

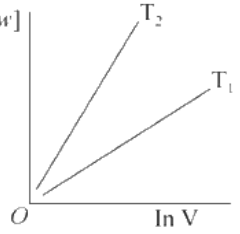
Answer: (A) $\frac{2}{3}$ K · Key from source paper

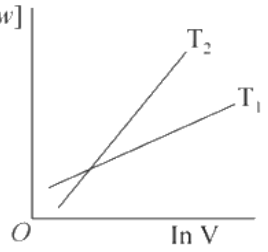
Q171 JEE Main 2019 · 9 Jan · Shift 1 MCQ

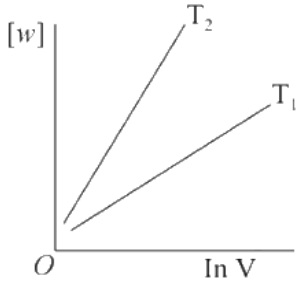
Consider the reversible isothermal expansion of an ideal gas in a closed system at two different temperatures T_1 and $T_2 T_1 < T_2$. The correct graphical depiction of the dependence of work done w vs the final volume V is:

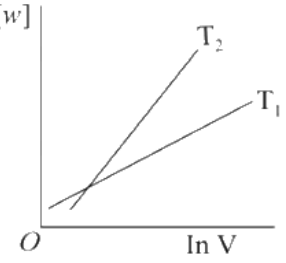
(see the figure above)

Q36. Consider the reversible isothermal expansion of an ideal gas in a closed system at two different temperatures T_1 and $T_2 T_1 < T_2$. The correct graphical depiction of the dependence of work done w vs the final volume V is:

(1) 

(2) 

(3) 

(4) 

(A) *see figure*

(B) *see figure*

(C) *see figure*

(D) *see figure*

Options (4) or (2) were accepted. More than one answer was accepted. · Key from source paper

Q172 JEE Main 2019 · 9 Jan · Shift 2 MCQ

The entropy change associated with the conversion of 1 kg of ice at 273 K to water vapours at 383 K is:

(Specific heat of water liquid and water vapour are 4.2 $kJ\ K^{-}$ (sic) and 2.0 $kJ\ K^{-1}kg^{-1}$; heat of liquid fusion and vaporization of water are 334 $kJ\ kg^{-1}$ and 2491 $kJ\ kg^{-1}$, respectively). ($\log 273 = 2.436, \log 373 = 2.572, \log 383 = 2.583$)

(A) $9.26\ kJ\ kg^{-1}K^{-1}$

(B) $2.64\ kJ\ kg^{-1}K^{-1}$

(C) $8.49\ kJ\ kg^{-1}K^{-1}$

(D) $7.90\ kJ\ kg^{-1}K^{-1}$

Answer: (A) $9.26\ kJ\ kg^{-1}K^{-1}$ · Key from source paper

Q173 JEE Main 2018 · 16 Apr · Online MCQ

For which of the following processes, ΔS is negative?

(A) C (diamond) $\rightarrow$ C (graphite)

(B) N_2(g, 1 atm) $\rightarrow$ N_2(g, 5 atm)

(C) N_2(g, 273K) $\rightarrow$ N_2(g, 300K)

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

Answer: (B) N_2(g, 1 atm) $\rightarrow$ N_2(g, 5 atm) · Key from source paper

Q174 JEE Main 2018 · 15 Apr · Shift 1 MCQ

For which of the following reactions, ΔH is equal to ΔU ?

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

(B) $2HI(g) \rightarrow H_2(g) + I_2(g)$

(C) $2SO_2\ (g) + O_2(g) \rightarrow 2SO_3(g)$

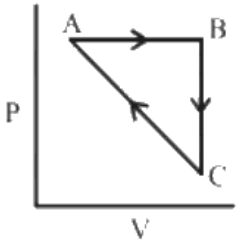
(D) $2NO_2(g) \rightarrow N_2O_4(g)$

Answer: (B) $2HI(g) \rightarrow H_2(g) + I_2(g)$ · Key from source paper

Q175 JEE Main 2018 · 15 Apr · Shift 1 MCQ

see figure

Q40.



An ideal gas undergoes a cyclic process as shown in Figure.

$\Delta U_{BC} = -5\ kJ\ mol^{-1}, q_{AB} = 2\ kJ\ mol^{-1}$

$W_{AB} = -5\ kJ\ mol^{-1},\ W_{CA} = 3\ kJ\ mol^{-1}$ Heat absorbed by the system during process CA is:

(1) $-5\ kJ\ mol^{-1}$ (2) $+5\ kJ\ mol^{-1}$

(3) $18\ kJ\ mol^{-1}$ (4) $-18\ kJ\ mol^{-1}$

(A) $-5\ kJ\ mol^{-1}$

(B) $+5\ kJ\ mol^{-1}$

(C) $18\ kJ\ mol^{-1}$

(D) $-18\ kJ\ mol^{-1}$

Answer: (B) $+5\ kJ\ mol^{-1}$ · Key from source paper

Q176 JEE Main 2018 · 15 Apr · Shift 2 MCQ

$\Delta_f G^\circ$ at 500 K for substance ' S ' in liquid state and gaseous state are $+100.7 kcal\ mol^{-1}$ and $+103\ kcal\ mol^{-1}$, respectively. Vapour pressure of liquid ' S ' at 500 K is approximately equal to:

$(\mathrm{R} = 2\mathrm{cal\,K^{-1}\,mol^{-1}})$.

(A) $100\ \mathrm{atm}$

(B) $1\ \mathrm{atm}$

(C) $10\ \mathrm{atm}$

(D) $0.1\ \mathrm{atm}$

Answer: (D) $0.1\ \mathrm{atm}$ · Checked by our team

Q177 JEE Main 2018 · 15 Apr · Shift 2 MCQ

Given (i) $2\mathrm{Fe_2O_3(s)} \rightarrow 4\mathrm{Fe(s)} + 3\mathrm{O_2(g)}$;
$\Delta_r\mathrm{G}^\circ = +1487.0\ \mathrm{kJ\ mol^{-1}}$
(ii) $2\mathrm{CO(g)} + \mathrm{O_2(g)} \rightarrow 2\mathrm{CO_2(g)}$;
$\Delta_r\mathrm{G}^\circ = -514.4\ \mathrm{kJ\ mol^{-1}}$
Free energy change, $\Delta_r\mathrm{G}^\circ$ for the reaction $2\mathrm{Fe_2O_3(s)} + 6\mathrm{CO(g)} \rightarrow 4\mathrm{Fe(s)} + 6\mathrm{CO_2(g)}$ will be:

(A) $-112.4\ \mathrm{kJ\ mol^{-1}}$

(B) $-56.2\ \mathrm{kJ\ mol^{-1}}$

(C) $-208.0\ \mathrm{kJ\ mol^{-1}}$

(D) $-168.2\ \mathrm{kJ\ mol^{-1}}$

Answer: (B) $-56.2\ \mathrm{kJ\ mol^{-1}}$ · Key from source paper

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Q178 JEE Main 2018 · 8 Apr · Offline MCQ

The combustion of benzene (l) gives $\mathrm{CO_2(g)}$ and $\mathrm{H_2O(l)}$. Given that heat of combustion of benzene at constant volume is $-3263.9\ \mathrm{kJ\ mol^{-1}}$ at $25^\circ\mathrm{C}$; the heat of combustion $(\mathrm{in\ kJ\ mol^{-1}})$ of benzene at constant pressure will be
$(\mathrm{R} = 8.314\ \mathrm{JK^{-1}\ mol^{-1}})$

(A) -3267.6

(B) 4152.6

(C) -452.46

(D) 3260

Answer: (A) -3267.6 · Key from source paper

Q179 JEE Main 2017 · 9 Apr · Online MCQ

An ideal gas undergoes isothermal expansion at constant pressure. During the process:

(A) Enthalpy remains constant but entropy increases
(B) Enthalpy decreases but entropy increases
(C) Enthalpy increases but entropy decreases
(D) Both enthalpy and entropy remain constant

Answer: (A) Enthalpy remains constant but entropy increases · Key from source paper

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Q180 JEE Main 2017 · 9 Apr · Online MCQ

A gas undergoes change from state A to state B. In this process, the heat absorbed and work done by the gas is 5 J and 8 J, respectively. Now gas is brought back to A by another process during which 3 J of heat is evolved. In this reverse process of B to A.

(A) 6 J of the work will be done by the gas
(B) 6 J of the work will be done by the surroundings on gas
(C) 10 J of the work will be done by the surroundings on gas
(D) 10 J of the work will be done by the gas

Answer: (B) 6 J of the work will be done by the surroundings on gas · Key from source paper

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Q181 JEE Main 2017 · 8 Apr · Online MCQ

The enthalpy change on freezing of 1 mol of water at $5^{\circ}\mathrm{C}$ to ice at $-5^{\circ}\mathrm{C}$ is:
(Given $\Delta_{\mathrm{fus}}\mathrm{H}$ = 6 kJ mol^{-1} at $0^{\circ}\mathrm{C}$,
$\mathrm{C_p(H_2O, l)}$ = 75.3 J $\mathrm{mol}^{-1}\,\mathrm{K}^{-1}$
$\mathrm{C_p(H_2O, s)}$ = 36.8 J $\mathrm{mol}^{-1}\,\mathrm{K}^{-1}$)

(A) 6.00 kJ mol^{-1}
(B) 5.81 kJ mol^{-1}
(C) 5.44 kJ mol^{-1}
(D) 6.56 kJ mol^{-1}

Answer: (D) 6.56 kJ mol^{-1} · Key from source paper

Q182 JEE Main 2017 · 8 Apr · Online MCQ

For a reaction, $\mathrm{A(g)} \rightarrow \mathrm{A(l)}$; $\Delta\mathrm{H} = -3\,\mathrm{RT}$. The correct statement for the reaction is

(A) $\Delta\mathrm{H} = \Delta\mathrm{U} = 0$
(B) $|\Delta\mathrm{H}| < |\Delta\mathrm{U}|$
(C) $|\Delta\mathrm{H}| > |\Delta\mathrm{U}|$
(D) $\Delta\mathrm{H} = \Delta\mathrm{U} \neq 0$

Answer: (C) $|\Delta\mathrm{H}| > |\Delta\mathrm{U}|$ · Key from source paper

Q183 JEE Main 2017 · 2 Apr · Offline MCQ

Given:

$C_{graphite} + O_{2g} \rightarrow CO_{2g}$; $\Delta_r H^o = -393.5\ kJ\ mol^{-1}$

$H_{2g} + \frac{1}{2}O_{2g} \rightarrow H_2Ol$; $\Delta_r H^o = -285.8\ kJ\ mol^{-1}$

$CO_{2g} + 2H_2Ol \rightarrow CH_{4g} + 2O_{2g}$; $\Delta_r H^o = +890.3\ kJ\ mol^{-1}$

Based on the above thermochemical equations, the value of $\Delta_r H^o$ at 298 K for the reaction $C_{graphite} + 2H_{2g} \rightarrow CH_{4g}$ will be:

(A) $+144.0\ kJ\ mol^{-1}$

(B) $-74.8\ kJ\ mol^{-1}$

(C) $-144.0\ kJ\ mol^{-1}$

(D) $+74.8\ kJ\ mol^{-1}$

Answer: (B) $-74.8\ kJ\ mol^{-1}$ · Key from source paper

Q184 JEE Main 2017 · 2 Apr · Offline MCQ

ΔU is equal to:

(A) Isobaric work

(B) Adiabatic work

(C) Isothermal work

(D) Isochoric work

Answer: (B) Adiabatic work · Key from source paper

Q185 JEE Main 2016 · 10 Apr · Online MCQ

If 100 mole of H_2O_2 decompose at 1 bar and 300 K, the work is done (kJ) by one mole of $O_2(g)$ as it expands against 1 bar pressure is:

$2H_2O_2(l) \rightleftharpoons 2H_2O(l) + O_2(g)$

$(R = 8.3\ J\ K^{-1}\ mol^{-1})$

(A) 124.50

(B) 249.00

(C) 498.00

(D) 62.25

Answer: (A) 124.50 · Key from source paper

Q186 JEE Main 2016 · 9 Apr · Online MCQ

For the reaction, $A(g) + B(g) \rightarrow C(g) + D(g)$, ΔH^o and ΔS^o are, respectively, $-29.8\ kJ\ mol^{-1}$ and $-0.100\ kJ\ K^{-1}\ mol^{-1}$ at 298 K. The equilibrium constant for the reaction at 298 k is:

(A) 1.0×10^{-10}
(B) 10
(C) 1
(D) 1.0×10^{10}

Answer: (C) 1 · Key from source paper

Q187 JEE Main 2016 · 9 Apr · Online MCQ

A reaction at 1 bar is non-spontaneous at low temperature but becomes spontaneous at high temperature. Identify the correct statement about the reaction among the following:

(A) ΔH is negative while ΔS is positive
(B) Both ΔH and ΔS are negative
(C) ΔH is positive while ΔS is negative
(D) Both ΔH and ΔS are positive

Answer: (D) Both ΔH and ΔS are positive · Key from source paper

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Q188 JEE Main 2016 · 3 Apr · Offline MCQ

The heats of combustion of carbon and carbon monoxide are -393.5 and -283.5 kJ mol^{-1}, respectively. The heat of formation (in kJ) of carbon monoxide per mole is:

(A) -676.5
(B) -110
(C) 110.5
(D) 676.5

Answer: (B) -110 · Key from source paper

Q189 JEE Main 2015 · 10 Apr · Online MCQ

The heat of atomization of methane and ethane are 360 kJ mol^{-1} and 620 kJ mol^{-1}, respectively. The longest wavelength of light capable of breaking the $\mathrm{C-C}$ bond is (Avogadro's number = 6.023×10^{23}, h = 6.62×10^{-34} J s)

(A) 2.48×10^{4} nm
(B) 1.49×10^{4} nm
(C) 2.48×10^{3} nm
(D) 1.49×10^{3} nm

Answer: (D) 1.49×10^{3} **nm** · Key from source paper

Q190 JEE Main 2015 · 4 Apr · Offline MCQ

The following reaction is performed at 298 K.
$2\mathrm{NO(g)} + \mathrm{O_2(g)} \rightleftharpoons 2\mathrm{NO_2(g)}$

The standard free energy of the formation of $NO(g)$ is $86.6\ kJ\ mol^{-1}$ at $298\ K$. What is the standard free energy of the formation of $NO_2(g)$ at $298\ K$? ($K_P = 1.6 \times 10^{12}$)

(A) $0.5\left[2 \times 86{,}600 - R(298)\ln\left(1.6 \times 10^{12}\right)\right]$

(B) $R(298)\ln\left(1.6 \times 10^{12}\right) - 86{,}600$

(C) $86{,}600 + R(298)\ln\left(1.6 \times 10^{12}\right)$

(D) $86{,}600 - \dfrac{\ln\left(1.6 \times 10^{12}\right)}{R(298)}$

Answer: (A) $0.5\left[2 \times 86{,}600 - R(298)\ln\left(1.6 \times 10^{12}\right)\right]$ · Key from source paper

Q191 JEE Main 2015 · 4 Apr · Offline MCQ

The standard Gibbs energy change at $300\ K$ for the reaction $2A \rightleftharpoons B + C$ is $2494.2\ J$. At a given time, the composition of the reaction mixture is $[A] = \frac{1}{2}$, $[B] = 2$ and $[C] = \frac{1}{2}$. The reaction proceeds in the:

$[R = 8.314\ J/K - mol\ ,\ e = 2.718\ ]$ {Given antilog $(-0.44) = 0.36$}

(A) Reverse direction because $Q < K_C$

(B) Forward direction because $Q > K_C$

(C) Reverse direction because $Q > K_C$

(D) Forward direction because $Q < K_C$

Answer: (C) Reverse direction because $Q > K_C$ · Key from source paper

Q192 JEE Main 2014 · 12 Apr · Online MCQ

The (S°) of the following substances are: CH_4 g)$186.2 JK^{-1}\ mol^{-1}$ O_2 (g) $205.2 JK^{-1}\ mol^{-1}$ CO_2(g) $213.6 JK^{-1}\ mol^{-1}$ H_2O(g) $69.9 .JK^{-1}\ mol^{-1}$ The entropy change (ΔS°) for the reaction $CH_4(g) + 2O_2(g) \rightarrow CO_2(g) + 2H_2O$ (l) is:

(A) $-312.5\ J\ K^{-1}\ mol^{-1}$

(B) $-242.8 JK^{-1}\ mol^{-1}$

(C) $-108.1 JK^{-1}\ mol^{-1}$

(D) $-37.6\ J\ K^{-1}\ mol^{-1}$

Answer: (B) $-242.8 JK^{-1}\ mol^{-1}$ · Key from source paper

Q193 JEE Main 2014 · 12 Apr · Online MCQ

The standard enthalpy of formation $(\Delta_f H^\circ_{298})$ for methane, CH_4 is $-74.9\ kJ\ mol^{-1}$. In order to calculate the average energy given out in the formation of a $C - H$ bond from this it is necessary to know which one of the following?

(A) The dissociation energy of the hydrogen molecule, H_2.
(B) The first four ionisation energies of carbon.
(C) The dissociation energy of H_2 and enthalpy and sublimation of carbon (graphite).
(D) The first four ionisation energies of carbon and electron affinity of hydrogen.

Answer: (C) The dissociation energy of H_2 and enthalpy and sublimation of carbon (graphite). · Checked by our team

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Q194 JEE Main 2014 · 11 Apr · Online MCQ

The molar heat capacity (C_p) of CD_2O is 10 cals at 1000 K. The change in entropy associated with cooling of 32 g of CD_2O vapour from 1000 K to 100 K at constant pressure will be: (D = deuterium, atomic mass = 2u)

(A) $23.03 \text{cal deg}^{-1}$
(B) $-23.03 \text{cal deg}^{-1}$
(C) $2.303 \text{cal deg}^{-1}$
(D) $-2.303 \text{cal deg}^{-1}$

Answer: (B) $-23.03 \text{cal deg}^{-1}$ · Key from source paper

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Q195 JEE Main 2014 · 9 Apr · Online MCQ

The standard enthalpy of formation of NH_3 is -46.0 kJ/mol. If bond enthalpy of H_2 is -436 kJ/mol and that of N_2 is -712 kJ/mol, the average bond enthalpy of N − H bond in NH_3 is :

(A) -964 kJ/mol
(B) -1102 kJ/mol
(C) $+1056$ kJ/mol
(D) $+352$ kJ/mol

Answer: (D) $+352$ kJ/mol · Key from source paper

Q196 JEE Main 2014 · 6 Apr · Offline MCQ

For complete combustion of ethanol,
$C_2H_5OH(l) + 3O_2(g) \rightarrow 2CO_2(g) + 3H_2O(l)$,
the amount of heat produced as measured in bomb calorimeter, is 1364.47 kJ mol^{-1} at 25°C. Assuming ideality the Enthalpy of combustion, $\Delta_c H$, for the reaction will be: (R = 8.314 kJ mol^{-1})

(A) -1366.95 kJ mol^{-1}
(B) -1361.95 kJ mol^{-1}
(C) -1460.50 kJ mol^{-1}
(D) -1350.50 kJ mol^{-1}

Answer: (A) -1366.95 kJ mol^{-1} · Key from source paper

Q197 JEE Main 2013 · 25 Apr · Online MCQ

Given that: (i) $\Delta_f H^\circ$ of N_2O is 82 kJ mol^{-1} (ii) Bond energies of N $\equiv$ N, N = N, O = O and N = O are 946, 418, 498 and 607 kJ mol^{-1} respectively, The resonance energy of N_2O is :

(A) -88 kJ
(B) -66 kJ
(C) -62 kJ
(D) -44 kJ

Answer: (A) -88 kJ · Key from source paper

Q198 JEE Main 2013 · 23 Apr · Online MCQ

Which of the following statements/relationships is not correct in thermodynamic changes ?

(A) $\Delta U = 0$ (isothermal reversible expansion of a gas)
(B) $w = -nRT \ln \frac{V_2}{V_1}$ (isothermal reversible expansion of an ideal gas)
(C) $w = nRT \ln \frac{V_2}{V_1}$ (isothermal reversible expansion of an ideal gas)
(D) For a system of constant volume heat involved directly changes to internal energy.

Answer: (C) $w = nRT \ln \frac{V_2}{V_1}$ **(isothermal reversible expansion of an ideal gas)** · Key from source paper

Q199 JEE Main 2013 · 9 Apr · Online MCQ

Given: (I) $H_2(g) + \frac{1}{2}O_2(g) \rightarrow H_2O(l)$; $\Delta H^\circ_{298\,K} = -285.9$ kJ mol^{-1} (II) $H_2(g) + \frac{1}{2}O_2(g) \rightarrow H_2O(g)$; $\Delta H^\circ_{298\,K} = -241.8$ kJ mol^{-1} The molar enthalpy of vapourisation of water will be :

(A) 241.8 kJ mol^{-1}
(B) 22.0 kJ mol^{-1}
(C) 44.1 kJ mol^{-1}
(D) 527.7 kJ mol^{-1}

Answer: (C) 44.1 kJ mol^{-1} · Checked by our team

Q200 JEE Main 2013 · 7 Apr · Offline MCQ

A piston filled with 0.04 mol of an ideal gas expands reversibly from 50.0 mL to 375 mL at a constant temperature of 37.0°C. As it does so, it absorbs 208 J of heat. The values of q and w for the process will be (R = 8.314 J/mol K) (ln7.5 = 2.01)

(A) q = -208 J, w = +208 J
(B) q = +208 J, w = +208 J
(C) q = +208 J, w = -208 J
(D) q = -208 J, w = -208 J

Answer: (C) q = +208 J, w = -208 J · Key from source paper

Q201 AIEEE 2012 · 26 May · Online MCQ

One mole of an ideal gas is expanded isothermally and reversibly to half of its initial pressure. ΔS for the process in $\mathrm{JK^{-1}\,mol^{-1}}$ is [$\ln 2 = 0.693$ and $R = 8.314$, J/(molK)]

(A) 6.76
(B) 5.76
(C) 10.76
(D) 8.03

Answer: (B) 5.76 · Key from source paper

Q202 AIEEE 2012 · 19 May · Online MCQ

The enthalpy of neutralisation of $\mathrm{NH_4OH}$ with HCl is $-51.46\ \mathrm{kJ\ mol^{-1}}$ and the enthalpy of neutralisation of NaOH with HCl is $-55.90\ \mathrm{kJ\ mol^{-1}}$. The enthalpy of ionisation of $\mathrm{NH_4OH}$ is

(A) $-107.36\ \mathrm{kJ\ mol^{-1}}$
(B) $-4.44\ \mathrm{kJ\ mol^{-1}}$
(C) $+107.36\ \mathrm{kJ\ mol^{-1}}$
(D) $+4.44\ \mathrm{kJ\ mol^{-1}}$

Answer: (D) $+4.44\ \mathrm{kJ\ mol^{-1}}$ · Key from source paper

Q203 AIEEE 2012 · 12 May · Online MCQ

The difference between the reaction enthalpy change ($\Delta_r \mathrm{H}$) and reaction internal energy change ($\Delta_r \mathrm{U}$) for the reaction:
$2\mathrm{C_6H_6(l)} + 15\mathrm{O_2(g)} \longrightarrow$
at 300 K is ($\mathrm{R} = 8.314\ \mathrm{J\,mol^{-1}\,K^{-1}}$)

(A) $0\ \mathrm{J\,mol^{-1}}$
(B) $2490\ \mathrm{J\,mol^{-1}}$
(C) $-2490\ \mathrm{J\,mol^{-1}}$
(D) $-7482\ \mathrm{J\,mol^{-1}}$

Answer: (D) $-7482\ \mathrm{J\,mol^{-1}}$ · Key from source paper

Q204 AIEEE 2012 · 7 May · Online MCQ

The entropy of a sample of a certain substance increases by $0.836\ \mathrm{J\ K^{-1}}$ on adding reversibly 0.3344 J of heat at constant temperature. The temperature of the sample is:

(A) 2.5 K
(B) 0.3 K
(C) 0.016 K
(D) 0.4 K

Answer: (D) 0.4 K · Key from source paper

Q205 AIEEE 2012 · Offline MCQ

The incorrect expression among the following is :

(A) $\frac{\Delta G_{system}}{\Delta S_{total}} = -T$
(B) In isothermal process $w_{reversible} = -nRT \ln \frac{V_f}{V_i}$
(C) $\ln K = \frac{\Delta H^0 - T\Delta S^0}{RT}$
(D) $K = e^{-\Delta G^0/RT}$

Answer: (C) $\ln K = \frac{\Delta H^0 - T\Delta S^0}{RT}$ · Key from source paper

Q206 AIEEE 2011 MCQ

The entropy change involved in the isothermal reversible expansion of 2 moles of an ideal gas from a volume of 10 dm^3 to a volume of 100 dm^3 at 27°C is :

(A) 35.8 J mol^{-1} K^{-1}
(B) 32.3 J mol^{-1} K^{-1}
(C) 42.3 J mol^{-1} K^{-1}
(D) 38.3 J mol^{-1} K^{-1}

Answer: (D) 38.3 J mol^{-1} K^{-1} · Key from source paper

Q207 AIEEE 2010 MCQ

The standard enthalpy of formation of NH_3 is -46.0 kJ mol^{-1}. If the enthalpy of formation of H_2 from its atoms is -436 kJ mol^{-1} and that of N_2 is -712 kJ mol^{-1}, the average bond enthalpy of $N-H$ bond in NH_3 is

(A) -964 kJ mol^{-1}
(B) $+352$ kJ mol^{-1}
(C) $+1056$ kJ mol^{-1}
(D) -1102 kJ mol^{-1}

Answer: (B) $+352$ kJ mol^{-1} · Key from source paper

Q208 AIEEE 2010 MCQ

For a particular reversible reaction at temperature T, ΔH and ΔS were found to be both $+ve$. If T_e is the temperature at equilibrium, the reaction would be spontaneous when

(A) $T_e > T$

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

(C) T_e is 5 times T

(D) $T = T_e$

Answer: (B) $\mathrm{T} > \mathrm{T_e}$ · Key from source paper

Q209 AIEEE 2009 MCQ

On the basis of the following thermochemical data: $\left(\Delta_f G^\circ \mathrm{H^+_{(aq)}} = 0\right)$

$\mathrm{H_2O}(\ell) \rightarrow \mathrm{H^+(aq) + OH^-(aq)};\ \Delta H = 57.32$ kJ

$\mathrm{H_2(g) + \frac{1}{2}O_2(g) \rightarrow H_2O}(\ell);\ \Delta H = -286.20$ kJ

The value of enthalpy of formation of $\mathrm{OH^-}$ ion at 25°C is:

(A) -22.88 kJ

(B) -228.88 kJ

(C) $+228.88$ kJ

(D) -343.52 kJ

Answer: (B) -228.88 kJ · Key from source paper

Q210 AIEEE 2008 MCQ

Oxidising power of chlorine in aqueous solution can be determined by the parameters indicated below:

$\frac{1}{2}\mathrm{Cl_2(g)} \xrightarrow{\frac{1}{2}\Delta_{\mathrm{ass}}H^\ominus} \mathrm{Cl(g)} \xrightarrow{\Delta_{\mathrm{eg}}H^\ominus} \mathrm{Cl^-(g)} \xrightarrow{\Delta_{\mathrm{mon}}H^\ominus} \mathrm{Cl^-(aq)}.$

The energy involved in the conversion of $\frac{1}{2}\mathrm{Cl_2(g)}$ to $\mathrm{Cl^-(g)}$ (using the data, $\Delta_{\mathrm{diss}}H^\ominus_{\mathrm{Cl_2}} = 240\,\mathrm{kJ\,mol^{-1}}$, $\Delta_{\mathrm{eg}}H^\ominus_{\mathrm{cl}} = -349\,\mathrm{kJ\,mol^{-1}}$, $\Delta_{\mathrm{hyd}}H^\ominus_{\mathrm{Cl}} = -381\,\mathrm{kJ\,mol^{-1}}$) will be

(A) $+152\,\mathrm{kJ\,mol^{-1}}$

(B) $-610\,\mathrm{kJ\,mol^{-1}}$

(C) $-850\,\mathrm{kJ\,mol^{-1}}$

(D) $+120\,\mathrm{kJ\,mol^{-1}}$

Answer: (B) $-610\,\mathrm{kJ\,mol^{-1}}$ · Key from source paper

Q211 AIEEE 2008 MCQ

Standard entropy of X_2, Y_2 and XY_3 are 60,40 and $50\,\mathrm{JK^{-1}\,mol^{-1}}$, respectively. For the reaction, $\frac{1}{2}X_2 + \frac{3}{2}Y_2 \rightarrow XY_3$, $\Delta\mathrm{H} = -30$ kJ, to be at equilibrium, the temperature will be

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(A) 1250 K
(B) 500 K
(C) 750 K
(D) 1000 K

Answer: (C) 750 K · Key from source paper

Q212 AIEEE 2007 MCQ

Assuming that water vapour is an ideal gas, the internal energy (ΔU) when 1 mol of water is vapourised at 1 bar pressure and 100°C, (Given: Molar enthalpy of vapourization of water at 1 bar and 373 K = 41 $\mathrm{kJ\ mol^{-1}}$ and R = 8.3 $\mathrm{J\ mol^{-1}\ K^{-1}}$) will be

(A) 4.100 $\mathrm{kJ\ mol^{-1}}$
(B) 3.7904 $\mathrm{kJ\ mol^{-1}}$
(C) 37.904 $\mathrm{kJ\ mol^{-1}}$
(D) 41.00 $\mathrm{kJ\ mol^{-1}}$

Answer: (C) 37.904 $\mathrm{kJ\ mol^{-1}}$ · Key from source paper

Q213 AIEEE 2007 MCQ

Identify the correct statement regarding a spontaneous process

(A) For a spontaneous process in an isolated system, the change in entropy is positive
(B) Endothermic processes are never spontaneous
(C) Exothermic processes are always spontaneous
(D) Lowering of energy in the reaction process is the only criterion for spontaneity

Answer: (A) For a spontaneous process in an isolated system, the change in entropy is positive · Key from source paper

Q214 AIEEE 2007 MCQ

In conversion of lime-stone to lime, $\mathrm{CaCO_3(\ s) \longrightarrow CaO(s) + CO_2(\ g)}$ the vales of ΔH° and ΔS° are +179.1 $\mathrm{kJ\ mol^{-1}}$ and 160.2 J/K respectively at 298 K and 1 bar. Assuming that ΔH° do not change with temperature, temperature above which conversion of limestone to lime will be spontaneous is

(A) 1008 K
(B) 1200
(C) 845 K
(D) 1118 K

Answer: (D) 1118 K · Key from source paper

Q215 AIEEE 2006 MCQ

The standard enthalpy of formation ($\Delta_f H^\circ$) at 298 K for methane, $CH_4(g)$, is $-74.8\ kJ\ mol^{-1}$. The additional information required to determine the average energy for C - H bond formation would be

(A) the dissociation energy of H_2 and enthalpy of sublimation of carbon
(B) latent heat of vapourization of methane
(C) the first four ionization energies of carbon and electron gain enthalpy of hydrogen
(D) the dissociation energy of hydrogen molecule, H_2

Answer: (A) the dissociation energy of H_2 and enthalpy of sublimation of carbon · Key from source paper

Q216 AIEEE 2006 MCQ

The enthalpy changes for the following processes are listed below:
$Cl_2(g) = 2Cl(g)$, $242.3\ kJ\ mol^{-1}$
$I_2(g) = 2I(g)$, $151.0\ kJ\ mol^{-1}$
$ICl(g) = I(g) + Cl(g)$, $211.3\ kJ\ mol^{-1}$
$I_2(s) = I_2(g)$, $62.76\ kJ\ mol^{-1}$
Given that the standard states for iodine and chlorine are $I_2(s)$ and $Cl_2(g)$, the standard enthalpy of formation for ICl(g) is

(A) $-14.6\ kJ\ mol^{-1}$
(B) $-16.8\ kJ\ mol^{-1}$
(C) $+16.8\ kJ\ mol^{-1}$
(D) $+244.8\ kJ\ mol^{-1}$

Answer: (C) $+16.8\ kJ\ mol^{-1}$ · Key from source paper

Q217 AIEEE 2006 MCQ

$(\Delta H - \Delta U)$ for the formation of carbon monoxide (CO) from its elements at 298 K is ($R = 8.314\ J\ K^{-1}\ mol^{-1}$)

(A) $-1238.78\ J\ mol^{-1}$
(B) $1238.78\ J\ mol^{-1}$
(C) $-2477.57\ J\ mol^{-1}$
(D) $2477.57\ J\ mol^{-1}$

Answer: (B) $1238.78\ J\ mol^{-1}$ · Checked by our team

Q218 AIEEE 2005 MCQ

Consider the reaction: $N_2 + 3H_2 \longrightarrow 2NH_3$ carried out at constant temperature and pressure. If ΔH and ΔU are the enthalpy and internal energy changes for the reaction, which of the following expressions is true?

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(A) $\Delta H = 0$
(B) $\Delta H = \Delta U$
(C) $\Delta H < \Delta U$
(D) $\Delta H > \Delta U$

Answer: (C) $\Delta H < \Delta U$ · Key from source paper

Q219 AIEEE 2005 MCQ

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

(A) $100\ \mathrm{kJ\ mol^{-1}}$
(B) $200\ \mathrm{kJ\ mol^{-1}}$
(C) $300\ \mathrm{kJ\ mol^{-1}}$
(D) None of these

Answer: (D) None of these · Key from source paper

Q220 AIEEE 2004 MCQ

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

(A) $-900\ \mathrm{J}$
(B) $900\ \mathrm{kJ}$
(C) $2780\ \mathrm{kJ}$
(D) $-900\ \mathrm{kJ}$

Answer: (A) $-900\ \mathrm{J}$ · Key from source paper

Q221 AIEEE 2004 MCQ

The enthalpies of combustion of carbon and carbon monoxide are -393.5 and $-283\ \mathrm{kJ\ mol^{-1}}$ respectively. The enthalpy of formation of carbon monoxide per mole is

(A) $110.5\ \mathrm{kJ}$
(B) $-110.5\ \mathrm{kJ}$
(C) $-676.5\ \mathrm{kJ}$
(D) $676.5\ \mathrm{kJ}$

Answer: (B) $-110.5\ \mathrm{kJ}$ · Key from source paper

Q222 AIEEE 2003 MCQ

The internal energy change when a system goes from state A to B is 40 kJ/mole. If the system goes from A to B by a reversible path and returns to state A by an irreversible path what would be the net change in internal energy?

(A) > 40 kJ
(B) < 40 kJ
(C) Zero
(D) 40 kJ

Answer: (C) Zero · Key from source paper

Q223 AIEEE 2003 MCQ

If at 298 K the bond energies of $\mathrm{C-H}$, $\mathrm{C-C}$, $\mathrm{C=C}$ and $\mathrm{H-H}$ bonds are respectively 414, 347, 615 and 435 kJ $\mathrm{mol^{-1}}$, the value of enthalpy change for the reaction $\mathrm{H_2C=CH_2(g) + H_2(g) \rightarrow H_3C-CH_3(g)}$ at 298 K will be

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

Answer: (C) -125 kJ · Key from source paper

Q224 AIEEE 2003 MCQ

In an irreversible process taking place at constant T and P and in which only pressure-volume work is being done, the change in Gibbs free energy (dG) and change in entropy (dS), satisfy the criteria

(A) $(\mathrm{dS})_{\mathrm{V,E}} > 0, (\mathrm{dG})_{\mathrm{T,P}} < 0$
(B) $(\mathrm{dS})_{\mathrm{V,E}} = 0, (\mathrm{dG})_{\mathrm{T,P}} = 0$
(C) $(\mathrm{dS})_{\mathrm{V,E}} = 0, (\mathrm{dG})_{\mathrm{T,P}} > 0$
(D) $(\mathrm{dS})_{\mathrm{V,E}} < 0, (\mathrm{dG})_{\mathrm{T,P}} < 0$

Answer: (A) $(\mathrm{dS})_{\mathrm{V,E}} > 0, (\mathrm{dG})_{\mathrm{T,P}} < 0$ · Key from source paper

Q225 AIEEE 2003 MCQ

The correct relationship between free energy change in a reaction and the corresponding equilibrium constant $\mathrm{K_c}$ is

(A) $-\Delta G = RT \ln K_c$
(B) $\Delta G^0 = RT \ln K_c$
(C) $-\Delta G^0 = RT \ln K_c$
(D) $\Delta G = RT \ln K_c$

Answer: (C) $-\Delta G^0 = RT \ln K_c$ · Key from source paper

Q226 AIEEE 2003 MCQ

The enthalpy change for a reaction does not depend upon

(A) use of different reactants for the same product
(B) the nature of intermediate reaction steps
(C) the differences in initial or final temperatures of involved substances
(D) the physical states of reactants and products

Answer: (B) the nature of intermediate reaction steps · Key from source paper

Q227 AIEEE 2002 MCQ

If an endothermic reaction is non- spantanous at freezing point of water and becomes feasible at its boiling point, then

(A) ΔH is - ve, ΔS is + ve
(B) ΔH and ΔS both are + ve
(C) ΔH and ΔS both are $-$ ve
(D) ΔH is + ve, ΔS is $-$ve

Answer: (B) ΔH and ΔS both are + ve · Key from source paper

Q228 AIEEE 2002 MCQ

A heat engine absorbs heat Q_1 at temperature T_1 and heat Q_2 at temperature T_2. Work done by the engine is $J(Q_1 + Q_2)$. This data

(A) violates 1st law of thermodynamics
(B) violates 1st law of thermodynamics if Q_1 is $-ve$
(C) violates 1st law of thermodynamics if Q_2 is $-$ ve
(D) does not violate 1st law of thermodynamics

Answer: (D) does not violate 1st law of thermodynamics · Checked by our team

Q229 AIEEE 2002 MCQ

The heat required to raise the temperature of body by 1 K is called

(A) specific heat
(B) thermal capacity
(C) water equivalent
(D) none of these

Answer: (B) thermal capacity · Key from source paper