



CHEMISTRY

NCERT - FULL MARKS CHEMISTRY(TAMIL)

THERMODYNAMICS -II

Self Evaluation A Choose The Correct Answer

1. The amount of heat exchanged with the surrounding at constant quantity _____

A. ΔE

B. ΔH

C. ΔS

D. ΔG

Answer:



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

A. decrease of entropy

B. increase in enthalpy

C. increase in free energy

D. decrease of free energy

Answer:



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

A. $q = w$

B. $q = 0$

C. $\Delta E = q$

$$D. P\Delta V = 0$$

Answer:



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4. When a liquid boils , there is ___ in entropy.

- A. an increase in entropy
- B. a decrease in entropy
- C. an increase in heat of vapourisation
- D. an increase in free energy

Answer:



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5. If ΔG for a reaction is negative , the change is

- A. Spontaneous
- B. Non-spontaneous
- C. Reversible
- D. Equilibrium

Answer:



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6. Which of the following does not result in an increase in the entropy ?

A. crystallisation of sucrose from solution

B. rusting of iron

C. conversion of ice to water

D. vaporisation of camphor

Answer:



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7. In which of the following process, the process is always non-feasible?

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

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

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

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

Answer:



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8. Change in Gibbs free energy is given by _____

A. $\Delta G = \Delta H + T\Delta S$

B. $\Delta G = \Delta H - T\Delta S$

C. $\Delta G = \Delta H \times T\Delta S$

D. None of the above

Answer:



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9. For the reaction $2Cl_{(g)} \rightarrow Cl_{2(g)}$, the signs of ΔH and ΔS respectively are

A. +, -

B. +, +

C. -, -

D. -, +

Answer:



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Self Evaluation B Answer In One Or Two Sentences

1. what is the usual definition of entropy ? What is the unit of entropy ?



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2. Predict the feasibility of a reaction when (i) both ΔH and ΔS positive (ii) both ΔH and ΔS negative (iii) ΔH decreases but ΔS increases



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3. Define Gibb's free energy .



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4. Give Kelvin statement of second law of thermodynamics.



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5. What is correct about ΔG ?



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6. Define order of a chemical reaction.



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Self Evaluation C Answer Not Exceeding 60 Words

1. State the various statements of second law of thermodynamics.

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2. What are spontaneous reactions? What are the conditions for the spontaneity of a process?

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Self Evaluation Exercises

1. Calculate the maximum efficiency % possible from a thermal engine operating between $110^{\circ}C$ and $25^{\circ}C$.



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2. What is the entropy change of an engine that operates at $100^{\circ}C$ when 453.6 kcal of heat is supplied to it?



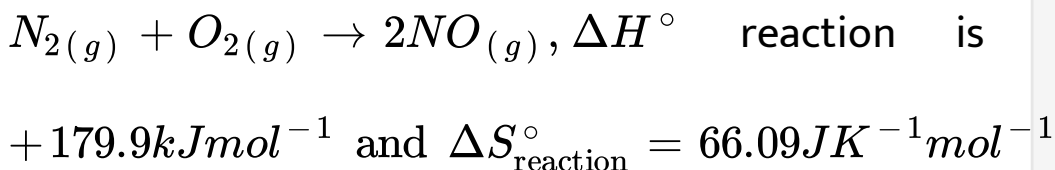
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3. Calculate the entropy increase in the evaporation of 1 mole of a liquid when it boils at $100^{\circ}C$ having heat of vaporisation at $100^{\circ}C$ as 540 cal/gm .



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4. In the reaction



. Calculate ΔG° reaction at 300K.



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5. Calculate the standard free energy change (Δ°) of the following reaction and say whether it is feasible at 373 K or not

$$\frac{1}{2}H_{2(g)} + \frac{1}{2}I_{2(g)} \rightarrow HI_{(g)}, \Delta H_r^\circ \text{ is } + 25.95 \text{ kJ mole}^{-1}.$$

Standard entropies of $HI_{(g)}$, $H_{2(g)}$ and $I_{2(g)}$ are 206.3, 130.6 and $116.7 JK^{-1} \text{mole}^{-1}$.



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6. Calculate standard free energy of formation of $H_2O_{(l)}$. The standard enthalpy of formation of $H_2O_{(l)}$ is 285.85 kJ and standard entropies of

$H_2(g)$, $O_2(g)$ and $H_2O(l)$ are 130.5, 205.0 and 70.3 $J.K^{-1}mole^{-1}$ respectively.



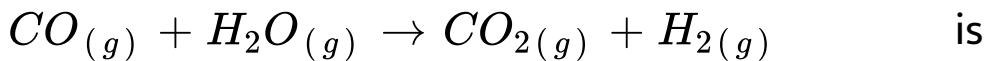
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7. Calculate ΔH_f° for the reaction $CO_2(g) + H_2(g) \rightarrow CO(g) + H_2O(g)$ given that ΔH_f^0 for $CO_2(g)$, $CO(g)$ and $H_2O(g)$ are -393.5 , -111.31 and $-242kJ mol^{-1}$ respectively.



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8. Predict whether the reaction

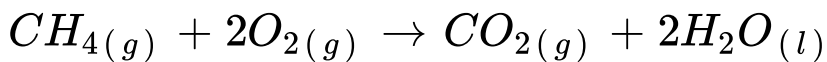


spontaneous or not. The standard free energies of formation of $CO_{(g)}$, $H_2O_{(g)}$ and $CO_{2(g)}$ are -137.27 , -228.6 and $-394.38 \text{ kJ mol}^{-1}$ respectively.



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9. The standard entropy change ΔS_r° for



is -242.98 JK^{-1} at 25°C . Calculate the standard reaction enthalpy for the above reaction if standard Gibbs energy of formation of

$CH_{4(g)}$, $CO_{2(g)}$ and $H_2O_{(l)}$ are -50.72 , -394.36 and $-237.13 \text{ kJ mol}^{-1}$ respectively.

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10. The standard heat of formation of $H_2O_{(l)}$ from its elements is $-285.83 \text{ kJ. mole}^{-1}$ and the standard entropy change for the same reaction is -327 JK^{-1} at 25°C . Will the reaction be spontaneous at 25°C ?

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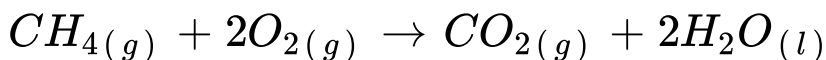
11. The boiling point of benzene at 1 atm is $80.2^{\circ}C$.

Calculate the enthalpy of vaporisation of benzene at its b. pt.



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12. The standard entropy change ΔS_r° for



is $-242.98 JK^{-1}$ at $25^{\circ}C$. Calculate the standard

reaction enthalpy for the above reaction if

standard Gibbs energy of formation of

$CH_4(g)$, $CO_2(g)$ and $H_2O(l)$ are -50.72 , -394.36

and $-237.13 kJ mol^{-1}$ respectively.



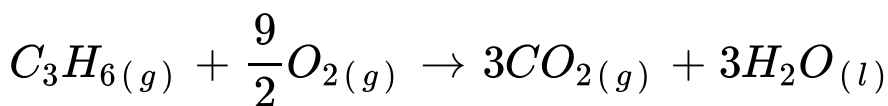
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13. Standard enthalpy change for combustion of methane is -890 kJ mol^{-1} and standard entropy change for the same combustive reaction is $-242.98 \text{ J. K}^{-1}$ at 25°C . Calculate ΔG° of the reaction.



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14. The standard entropy change for the reaction



is -339.23 JK^{-1} at 25°C . Calculate the standard

reaction enthalpy change if the standard Gibbs energy of formation of $C_3H_6(g)$, $CO_2(g)$ and $H_2O(l)$ are 62.78, - 394.36 and $-237.13 \text{ kJ.mol}^{-1}$ respectively.



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