YAKEEN NEET 2.0

2026

Thermodynamics & Thermochemistry

Physical Chemistry | Lecture -11

By- Amit Mahajan Sir

Topics to be covered

1. Revision of Last Class
2. Entropy
3. Magarmach Practice Questions, Home work from Modules,

Rules to Attend Class

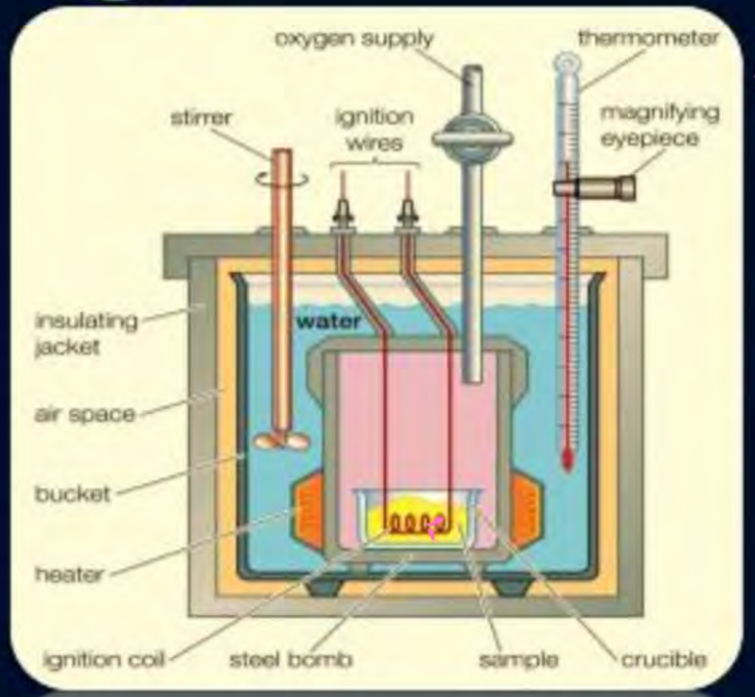
1. Always sit in a peaceful environment with headphone and be ready with your copy and pen.
2. Never ever attend a class from in between or don't join a live class in the middle of the chapter.
3. Make sure to revise the last class before attending the next class & always complete your Magarmach Practice Questions.
4. Never ever engage in chat whether live or recorded on the topic which is not being discussed in current class as by doing so u can be blocked by the admin team or your subscription can be cancelled.

Rules to Attend Class

5. Try to make maximum notes during the class if something is left then u can use the notes pdf after the class to complete the remaining class.
6. Always ask your doubts in doubt section to get answer from faculty. Before asking any doubt please check whether same doubt has been asked by someone or not.

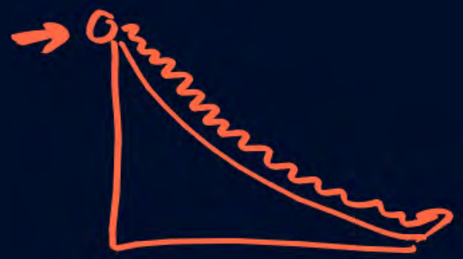

There is one big flaw in your Preparation that's name is Backlog ? What do we say to Backlog ?
NOT TODAY !!!

Revision of Last Class



$$\Delta U = q_v = \frac{(ms)_{H_2O}\Delta T + (ms)_{Bc}\Delta T}{n}$$

$$\Delta H = \Delta U + \Delta n_g RT$$




Bro, check out these chips! So crispy ki A SMR bhi jealous ho jaaye!
CHIPS
Arre, sambhal! Yeh hawa chips ko bhi romantic lagti hai – it hugs them tight!
Nahiiiii! Mere chips ka crispiness ka funeral ho gaya!
plop
plop
Spontaneous process = happens naturally without external energy. Like me automatically failing maths test...


Bro, non-spon-taneous process hai! Ice cream ko wapas solid karna = energy input chahiye
Bas, bas, reverse hoja! Re-freeze hoja! Jugaad mode ON
Mood bhi melt ho gaya.

Tendency for Minimum Energy

$R \longrightarrow P$

$H_R > H_P$

$\Delta H = H_P - H_R = (-)ve$

Tendency for Maximum Entropy

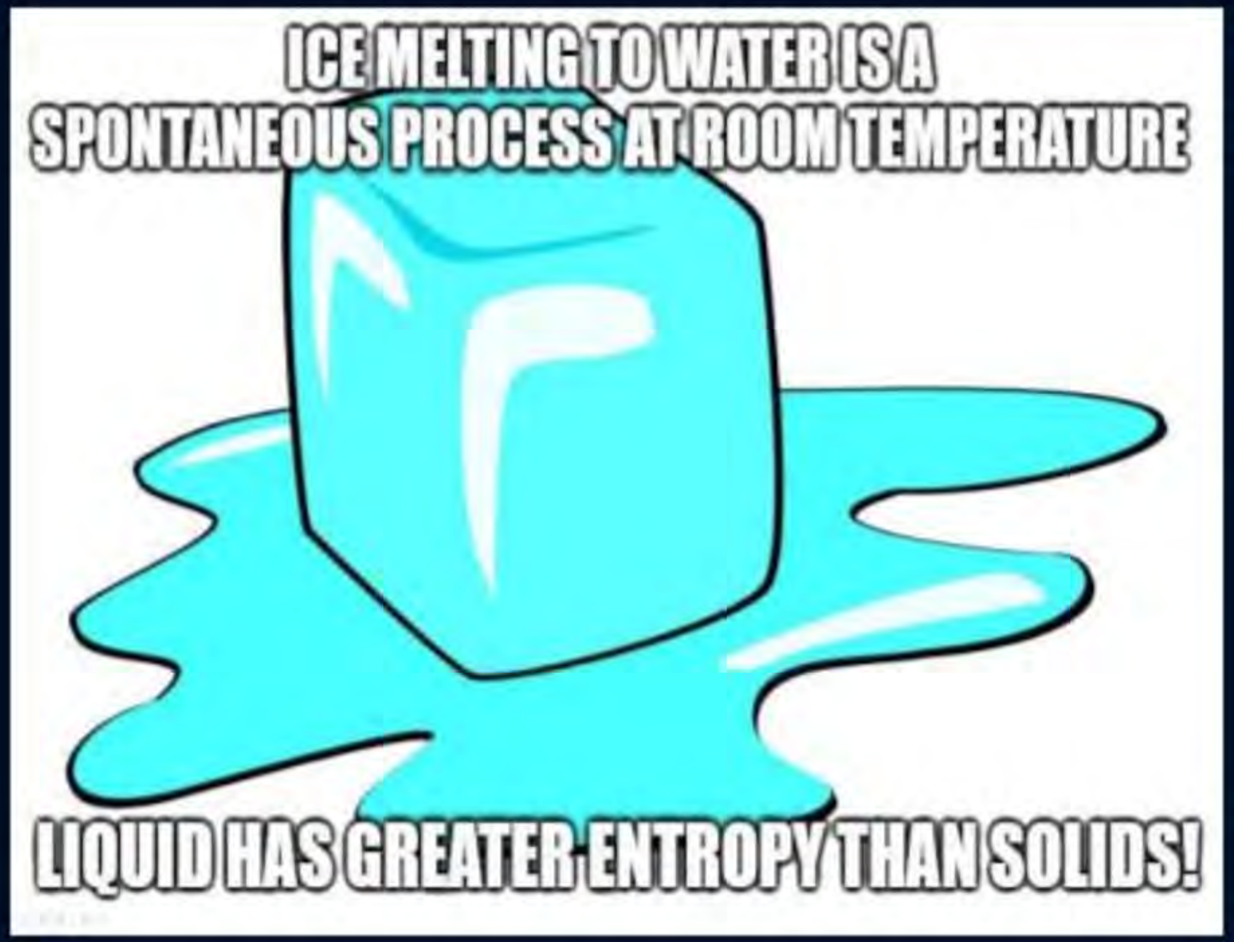
Entropy :
Measure of disorder or randomness

$$R \longrightarrow P$$

S_R S_P

$$S_P > S_R$$

$$\Delta S = S_P - S_R = (+)ve$$



Entropy(S)

#MIT

Stretch →

① $S_{gas} > S_{liquid} > S_{solid}$

S ↑

② egg (l) —Boil→ egg (s)

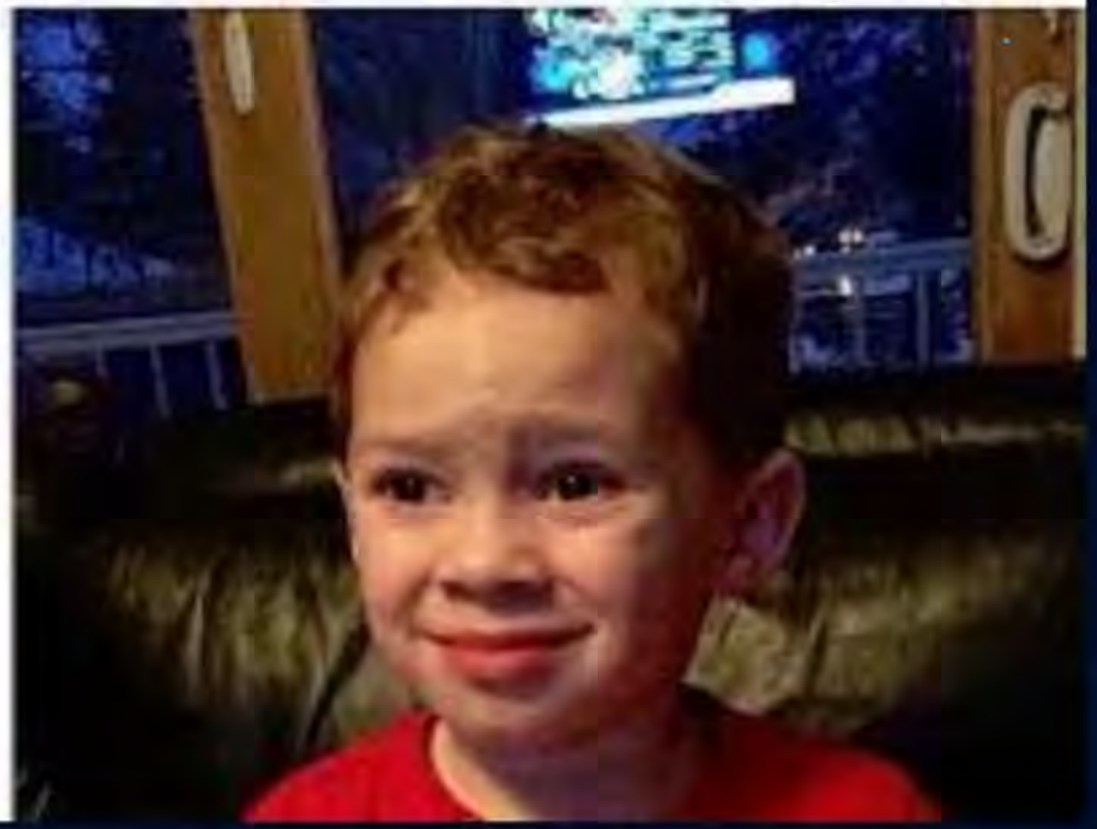
Boiling of an egg S ↑ h^2CO_3 denaturation of protein occur.

③ Stretching of rubber ∴ S ↓

④ $\Delta S = (+)ve$ if $\Delta n_g = (+)ve = n_{p(g)} - n_{r(g)}$

$\Delta S = (-)ve$ if $\Delta n_g = (-)ve =$ " "

me trying to act normal around my friends but I start thinking about Entropy



#MIT

③ no. of gas molecules ↑ ∴ S ↑

④ if molecules same then atomicity ↑ S ↑ 1 mole $O_3(g)$ > 1 mole $O_2(g)$; S ↑

⑤ molecules same & atomicity same ∴ size ↑ S ↑ 1 $F_2(g)$ < 1 mole $Cl_2(g)$; S ↑

⑥ $S_{Pure\ metal} < S_{alloy}$

⑦ $S_{graphite} > S_{Diamond}$

⑧ $xA \longrightarrow yB$

$$\Delta S = \sum y S_P - \sum x S_R$$

⑨ A ⇌ B (Rev, iso. exp)

$$\Delta S = \frac{q_{rev.\ iso.}}{T}$$

↑ S ∝ T ↑

⑩ 1 mole solid $\xrightarrow{\Delta H_{fusion}}$ 1 mole liquid

$$\Delta S_{fusion} = \frac{\Delta H_{fusion}}{T_m}$$

T_m = melting pt.

(11) 1 mole liquid $\xrightarrow{\Delta H_{vaporisation}}$ 1 mole gas.

T_B = Boiling Pt.

$$\Delta S_{vaporisation} = \frac{\Delta H_{vaporisation}}{T_B}$$

$88 = \frac{176}{2} = \frac{264}{3}$

Trouton's rule → $\Delta S_{vap.} = 88 \ JK^{-1}mol^{-1}$

↓

not applicable for H-Bonded liquids or metallic bond

↓

$H_2O(l)$, $C_2H_5OH(l)$

↓

$Hg(l)$

(12) 1 mole solid $\xrightarrow{\Delta H_{sublimation}}$ 1 mole gas

$$\Delta S_{sublimation} = \frac{\Delta H_{sub.}}{T}$$

T = Sublime Temp

$\Delta S_{sub.} = \Delta S_{fus.} + \Delta S_{vap.}$

$2NH_3(g) \longrightarrow 1N_2(g) + 3H_2(g)$ $\quad \Delta n_g = 4 - 2 = (+)ve$

$\frac{1}{8}S_8(g) + 1O_2(g) \longrightarrow 1SO_2(g)$ $\quad \Delta n_g = 1 - \frac{9}{8} = (-)ve$

2 Page blank

QUESTION – (NEET 2016 - I)

The correct thermodynamic conditions for the spontaneous reaction at all temperatures is:

(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 $\Delta S > 0$

QUESTION – (AIPMT 2012)

The enthalpy of fusion of water is 1.435 kcal/mol. The molar entropy change for the melting of ice at 0°C is:

A. 10.52 cal/(mol K)

B. 21.04 cal/(mol K)

C. 5.260 cal/(mol K)

D. 0.526 cal/(mol K)

QUESTION

Consider following statements :

I. Molar entropy of a substance follows the order.

$(S)_{solid} < (S)_{liquid} < (S)$ gas

II. Entropy increases when $O_2(g)$ changes to O (g) atoms

$O_2(g) \longrightarrow 2O(g)$

III. Molar entropy of a substance is zero at absolute zero.

Select the correct statement (s).

A) I, II

B) I,III

C) II,III

D) I,II,III

QUESTION – (NEET 2024)

In which of the following processes entropy increases?

A. A liquid evaporates to vapour

B. Temperature of a crystalline solid lowered from 130 K to 0 K.

C. $2NaHCO_{3(g)} \rightarrow Na_2CO_{3(s)} + CO_{2(g)} + H_2O_{(g)}$

D. $Cl_{2(g)} \rightarrow 2Cl_{(g)}$

Choose the correct answer from the options given below.

A A and C

B A, B and D

C A, C and D

D C and D

QUESTION – (NEET 2019)

In which case change in entropy is negative?

(A) Evaporation of water

(B) Expansion of a gas at constant temperature

(C) Sublimation of solid to gas

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

QUESTION – (AIPMT 2012)

The enthalpy of fusion of water is 1.435 kcal/mol. The molar entropy change for the melting of ice at 0°C is:

A. 10.52 cal/(mol K)

B. 21.04 cal/(mol K)

C. 5.260 cal/(mol K)

D. 0.526 cal/(mol K)

QUESTION – (NEET 2024)

In which of the following processes entropy increases?

A. A liquid evaporates to vapour

B. Temperature of a crystalline solid lowered from 130 K to 0 K.

C. $2NaHCO_{3(g)} \rightarrow Na_2CO_{3(s)} + CO_{2(g)} + H_2O_{(g)}$

D. $Cl_{2(g)} \rightarrow 2Cl_{(g)}$

Choose the correct answer from the options given below.

A A and C

B A, B and D

C A, C and D

D C and D

QUESTION – (NEET 2019)

In which case change in entropy is negative?

(A) Evaporation of water

(B) Expansion of a gas at constant temperature

(C) Sublimation of solid to gas

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

QUESTION – (AIIMS 2011)

Which of the following processes takes place with decrease of entropy?

(A) Solid → gas

(B) sugar + water → solution

(C) $NH_3(g) + HCl(g) \rightarrow NH_4Cl(s)$

(D) A(g) + B(g) → mixture

QUESTION – (AIIMS 2006)

Assertion: Water in liquid state is more stable than ice at room temperature.
Reason: Water in liquid form has higher entropy than ice.

A. If both Assertion and Reason are correct and the Reason is a correct explanation of the Assertion.

B. If both Assertion and Reason are correct but Reason is not a correct explanation of the Assertion.

C. If the Assertion is correct but Reason is incorrect.

D. If both the Assertion and Reason are incorrect.

E. If the Assertion is incorrect but the Reason is correct.

QUESTION – (AIIMS 2000)

Assertion: Entropy of ice is less than water.
Reason: Ice has cage like structure.

A If both Assertion and Reason are correct and the Reason is a correct explanation of the Assertion.

B If both Assertion and Reason are correct but Reason is not a correct explanation of the Assertion.

C If the Assertion is correct but Reason is incorrect.

D If both the Assertion and Reason are incorrect.

E If the Assertion is incorrect but the Reason is correct.

QUESTION – (AIIMS 2003)

Which one of the following has ΔS° greater than zero?

(A) $CaO(s) + CO_2(g) \rightarrow CaCO_3(s)$

(B) $NaCl\ (aq) \rightarrow NaCl(s)$

(C) $NaNO_3(s) \rightarrow Na^+(aq) + NO_3^-(aq)$

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

QUESTION

5 mole of an ideal gas expands reversibly from a volume of 8 dm^3 to 80 dm^3 at a constant temperature 27°C. The change in entropy is:

A. 41.57 JK^{-1}

B. –95.73 JK^{-1}

C. 95.73 JK^{-1}

D. –41.57 JK^{-1}

QUESTION – (AIIMS 2018, 27 May)

What is entropy change in 2 mol N_2, when its temperature is 2 taken from 400 K to 800 K, adiabatically.

A) 30 J/K

B) 60 J/K

C) 40 J/K

D) 20 J/K

QUESTION

Find the entropy change in the reaction:

$$1Fe_2O_3(s) + 3H_2(g) \longrightarrow 2Fe(s) + 3H_2O(l)$$

$S°_m(Fe_2O_3(s)) = 90$, $S°_m(Fe, S) = 30$, $S°_m(H_2(g)) = 120$, $S°_m(H_2O, l) = 70\ JK^{-1}\ mol^{-1}$

QUESTION

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. 38.3 $J\ mol^{-1}\ K^{-1}$

B. 35.8 $J\ mol^{-1}\ K^{-1}$

C. 32.3 $J\ mol^{-1}\ K^{-1}$

D. 42.3 $J\ mol^{-1}\ K^{-1}$

QUESTION

Find the change in entropy (in cal/K) of 1 mole of O_2 gas ($C_V = 5/2R$), when it is

(a) Heated from 300 K to 400 K isobarically

(b) Heated from 300 K to 400 K isochorically (given: ln3 = 1.1, ln2 = 0.7)

QUESTION

The entropy change when two moles of ideal monoatomic gas is heated from 200°C to 300°C reversibly and isochorically:

A $3/2R \ln(300/200)$

B $5/2R \ln(573/273)$

C $3R \ln(573/473)$

D $3/2R \ln(573/473)$

QUESTION

When 1 mole of ideal gas is compressed to half of it's initial volume and simultaneously heated to twice its temperature, change in entropy is:

A $C_{v,m} \ln 2$

B $C_{p,m} \ln 2$

C $R \ln 2$

D $(C_{v,m} - R) \ln 2$

QUESTION

Entropy change of vaporisation of $H_2O(l)$ at 1 atm pressure is 26.81 cal mol^{-1} K^{-1}. Thus, latent heat of vaporisation of $H_2O(l)$ is

A. 26.81 cal mol^{-1}

B. 10.0 kcal mol^{-1}

C. 10.00 cal mol^{-1}

D. 100.0 kcal mol^{-1}

QUESTION

$H_2O(s) \longrightarrow H_2O(l)$, $\Delta H = x_1$ cal mol^{-1} at T(K)

$H_2O(s) \longrightarrow H_2O(g)$, $\Delta H = x_2$ cal mol^{-1} T(K)

Entropy change for $H_2O(l) \longrightarrow H_2O(g)$ is in cal mol^{-1} K^{-1}

A $\left(\frac{x_1+x_2}{T}\right)$

B $\left(\frac{x_1-x_2}{T}\right)$

C $\left(\frac{x_2+x_1}{T}\right)$

D $-\left(\frac{x_1+x_2}{T}\right)$

QUESTION

1 mole of an ideal gas at 298 K is expanded isothermally and reversibly from 10 L to 100 L. Thus, entropy change is (in JK^{-1})

A 2.303×8.314

B -2.303×8.314

C 8.314

D -8.314

QUESTION

Temperature of one mole of an ideal gas changes from T_1 to T_2 and simultaneously volume changes from V_1 to V_2. Thus,

A $\Delta S = R\log\frac{V_2}{V_1} + C_p\log\frac{T_2}{T_1}$

B $\Delta S = R\log\frac{V_2}{V_1} + (C_V + R)\log\frac{T_2}{T_1}$

C $\Delta S = R\log\frac{V_2T_2}{V_1T_1} + C_V\log\frac{T_2}{T_1}$

D All of these are correct

QUESTION

When the following processes are carried out as given for diatomic ideal gas,

I. temperature is made four times and simultaneously,

II. pressure is made one-fourth, then $(\Delta S)_{system}$ is

A) 9RIn2

B) –9Rln 2

C) 4Rln 2

D) 8RIn 2

Magarmach Practice Questions

QUESTION – (AIIMS 2019)

1 mole of a diatomic gas is heated through isochoric process from 300 K to 500 K. The entropy is:

A 10.61

B 38.26

C 20.05

D 30

QUESTION – (AIIMS 2018, 27 May)

What is entropy change in 2 mol N_2, when its temperature is 2 taken from 400 K to 800 K, adiabatically.

A 30 J/K

B 60 J/K

C 40 J/K

D 20 J/K

QUESTION – (AIIMS 2011)

Which of the following processes takes place with decrease of entropy?

A Solid gas

B sugar + water → solution

C $NH_3(g) + HCl(g) \rightarrow NH_4Cl(s)$

D $A(g) + B(g) \rightarrow$ mixture

QUESTION – (AIIMS 2006)

Assertion: Water in liquid state is more stable than ice at room temperature.
Reason: Water in liquid form has higher entropy than ice.

A. If both Assertion and Reason are correct and the Reason is a correct explanation of the Assertion.

B. If both Assertion and Reason are correct but Reason is not a correct explanation of the Assertion.

C. If the Assertion is correct but Reason is incorrect.

D. If both the Assertion and Reason are incorrect.

E. If the Assertion is incorrect but the Reason is correct.

QUESTION – (AIIMS 2000)

Assertion: Entropy of ice is less than water.
Reason: Ice has cage like structure.

A If both Assertion and Reason are correct and the Reason is a correct explanation of the Assertion.

B If both Assertion and Reason are correct but Reason is not a correct explanation of the Assertion.

C If the Assertion is correct but Reason is incorrect.

D If both the Assertion and Reason are incorrect.

E If the Assertion is incorrect but the Reason is correct.

QUESTION – (AIIMS 2003)

Which one of the following has ΔS° greater than zero?

A $CaO(s) + CO_2(g)$ $CaCO_3(s)$

B $NaCl\ (aq)$ $NaCl(s)$

C $NaNO_3(s)$ $Na^+(aq) + NO_3^-(aq)$

D $N_2\ (g) + 3H_2\ (g)$ $2NH_3(g)$

THANK YOU