YAKEEN NEET 2.0

2026

Thermodynamics & Thermochemistry

Physical Chemistry | Lecture -6

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Topics to be covered

1. Medics Test, Revision of Last Class
2. Numericals, Adiabatic Process
3. 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 !!!

QUESTION

M = 60 120

A mixture contains equal masses of urea (N_2OCH_4) tetrose ($C_4H_8O_4$) and glucose ($C_6H_{12}O_6$) mole ($C_4H_8O_4$) fractions at points A, B, and C are that of

180

eq. mass = 180g

$n_u = \frac{180}{60} = 3$

$n_T = \frac{180}{120} = 1.5$

$n_g = \frac{180}{180} = 1$

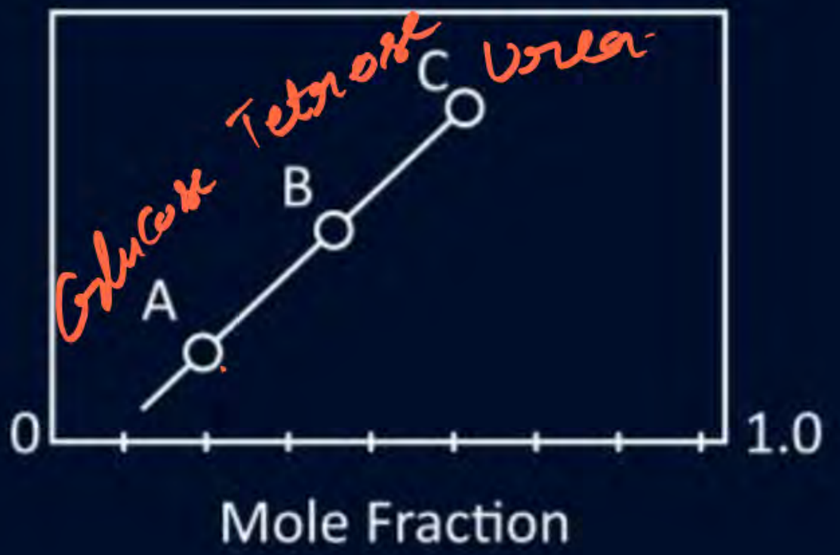
$g_{bu} = \frac{B}{5.5}$

(A) glucose, tetrose, urea

(B) glucose, urea tetrose

(C) urea, tetrose, glucose

(D) urea, glucose, tetrose



QUESTION

$n = \frac{w}{M}$

A mixture contains solutes A, B, C, and D of equal molar masses, in mass ratio 1 : 2 : 3 : 4. Which has maximum value of mole fraction?

Let Molar Mass = 1

$n_A = \frac{1}{1}$

$n_B = \frac{2}{1}$

$n_C = \frac{3}{1}$

$n_D = \frac{4}{1}$

(A) A

(B) B

(C) C

(D) D ✓

QUESTION

In the following reaction,

$2KClO_3 \xrightarrow{\Delta} 2KCl + 3O_2$

5.0 g of $KClO_3$ gave 0.03 mole of O_2. Hence, per cent purity of $KClO_3$ is

(A) 49%

(B) 50%

(C) 95%

(D) 98%

$KClO_3$
$39+35.5+48$
74.5
48
122.5

$m_{KClO_3} = \frac{0.02}{100} \times 122.5 \times 10 = \frac{2450}{1000} = 2.45\,g$

$\%\ \text{purity of } KClO_3 = \frac{2.45}{5} \times 100$

$= 49\%$

QUESTION

$CaCO_3$ is decomposed by dil. HCl

$CaCO_3 + 2HCl \rightarrow CaCl_2 + H_2O + CO_2$

Volume of HCl (d = 1.825 g cm 3) required to decompose 10 g of 50% pure $CaCO_3$ is

(A) 1.8 mL

(B) 1.0 mL

(C) 4.8 mL

(D) 2.0 mL ✓

$W_{CaCO_3} = \frac{50}{100} \times 10 = 5g$

$n_{CaCO_3} = \frac{5}{100} = 0.05$

$n_{HCl} = 0.05 \times 2 = 0.1$

mass HCl $= 0.1 \times 36.5$

$= 3.65g$

$V_{HCl} = ?$

$d_{HCl} = 1.825 g/mL$

$3.65 = V \times 1.825$

$V = \frac{3.650}{1.825} = 2mL$

QUESTION

ClO_x^-

-2

In basic medium, Cl_2 disproportionates into Cl^- and ClO_x^-. If there is loss and gain of one mole of electron per mole of Cl_2, then the value of x is:

$$Cl_2^{0} + OH^- \longrightarrow Cl^- + Cl^{+1}O_x^-$$

1 mole e^- lost · 1 mole e^- gained

$+1 - 2x = -1$

$+2x = +2$

$x = 1$

A 3

B 1

C 2

D 4

QUESTION

In the reaction,

$$\overset{+4\ -1}{MnO_2} + \underline{4HCl} \rightarrow \overset{-1}{MnCl_2} + \overset{0}{Cl_2} + \overset{+1}{2H_2O},$$

The equivalent weight of HCl is:

$n_f = \frac{1 \times 2}{4} = \frac{1}{2}$

$E = \frac{M}{n_f} = \frac{M}{\frac{1}{2}} = 2M$

(A) M

(B) M/2

(C) 2M

(D) M/4

QUESTION

In which of the following reactions, 1 g equivalent of H_3PO_4 reacts with 3 g equivalents of NaOH?

(A) $H_3PO_4 + NaOH \rightarrow NaH_2PO_4 + H_2O$

(B) $H_3PO_4 + 2NaOH \rightarrow Na_2HPO_4 + 2H_2O$

(C) $H_3PO_4 + 3NaOH \rightarrow Na_3PO_4 + 3H_2O$

(D) None of the above

QUESTION

A quantity of 8.6 g of an oxide of a metal reacts completely with hydrogen gas to yield 1.8 g of water. The equivalent weight of the metal is:

(A) 23

(B) 37

(C) 78

(D) 35

Metal oxide + H_2 → H_2O + M

8.6 g 1.8 g

$$\frac{8.6}{E_M + 8} = \frac{1.8}{9}$$

$$43 = E_M + 8$$

$$E_M = 35 \text{ g}$$

MEDICS Test

↓

Solution Chapter Complete → Monday

↓

Moderate

Revision of Last Class

$C_p - C_v = nR$.

$C_{p,m} - C_{v,m} = R$

$\gamma = \frac{C_{p,m}}{C_{v,m}}$ → mono → 1.67, dia → 1.4, Tri Poly → 1.33

$\gamma_{mix} = \frac{C_{p,m\,mix}}{C_{v,m\,mix}} \rightarrow \frac{n_1 C_{p_1} + n_2 C_{p_2} \cdots}{n_1 + n_2 \cdots}$

$\downarrow$

$\frac{n_1 C_{v_1} + n_2 C_{v_2} \cdots}{n_1 + n_2 \cdots}$

Isothermal Rev. exp

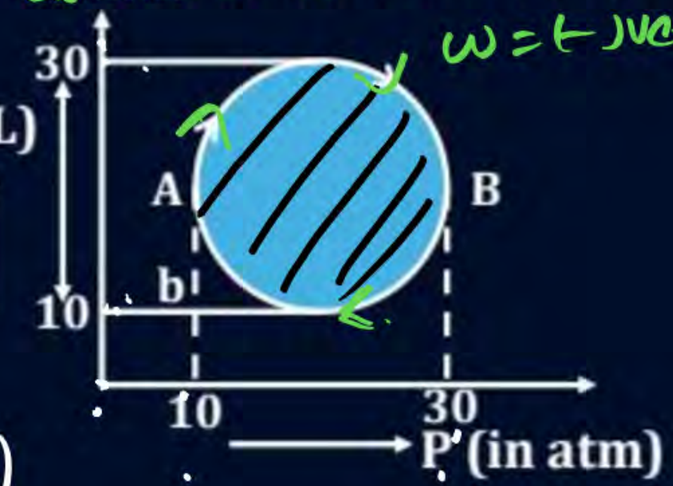
$w = -nRT \ln \frac{V_2}{V_1}$

Isothermal irrev. exp

$w = -nRT\left(1 - \frac{P_2}{P_1}\right)$

QUESTION

Heat absorbed by system in going through a cyclic process is shown in the figure is:



Ans $q = ?$ $\quad \Delta U = q + w \quad \Delta U = 0$

$q = -w$

$w = \text{Area}$

$= \pi R^2$

$= \pi \left(\frac{P_2 - P_1}{2}\right)\left(\frac{V_2 - V_1}{2}\right)$

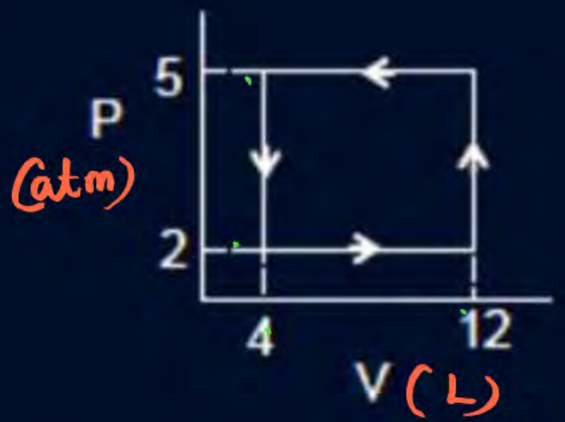
$= 3.14 \left(\frac{30-10}{2}\right)\left(\frac{30-10}{2}\right) = 3.14 \times 10 \times 10$

$= 314$ L atm

$\approx 314 \times 101.3$ J

QUESTION – (AIIMS 2018, 27 May)

The work done is the above cyclic process is:



(A) 12 atm × L

(B) 24 atm × L

(C) 48 atm × L

(D) 36 atm × L

$W = \text{Area} = 8 \times 3 = 24\ \text{L atm}$

QUESTION – (AIIMS 2003)

$1 H_2O(l) \longrightarrow 1 H_2O(g)$ $T = 373\,K.$ $P = 1\,atm.$ $\Delta U \neq 0$ $\Delta T = 0$

Assertion: The increase in internal energy (ΔE) for the vaporization of one mole of water at 1 atm and 373 K is zero. ✗

Reason: For all isothermal processes, $\Delta E = 0$ ✗

(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

The internal energy change (in J) when 90 g of water undergoes complete evaporation at 100°C is..... , (Given: ΔH_{vap} for water at 373 K = 41kJ/mol, R = 8.314 $JK^{-1} mol^{-1}$)

$n_{H_2O} = \frac{90}{18} = 5$

$\Delta U = ?$

$T = 100^\circ C$

$= 373 K.$

$\Delta H = 41000 J/mol.$

Total $\Delta H = 41000 \times 5$

$= 205000 J$

$5H_2O(l) \rightarrow 5H_2O(g)$

$\Delta n_g = 5 - 0 = 5$

$205000 = \Delta U + \frac{5 \times 25 \times 373}{3}$ (125)

$205000 - 15625 = \Delta U$

QUESTION – (AIPMT 2004)

The work done during the expansion of a gas from a volume of 4 dm^3 to 6 dm^3 against a constant external pressure of 3 atm is: (1 L atm = 101.32 J)

(A) – 6 J

(B) – 608 J

(C) + 304 J

(D) – 304 J

$V_1 = 4\ L$

$V_2 = 6\ L$

$P_{ext} = 3\ atm.$

$w = -P_{ext} \cdot \Delta V$

$= -3 \times 2\ L\ atm$

$= -6 \times 101.32\ J$

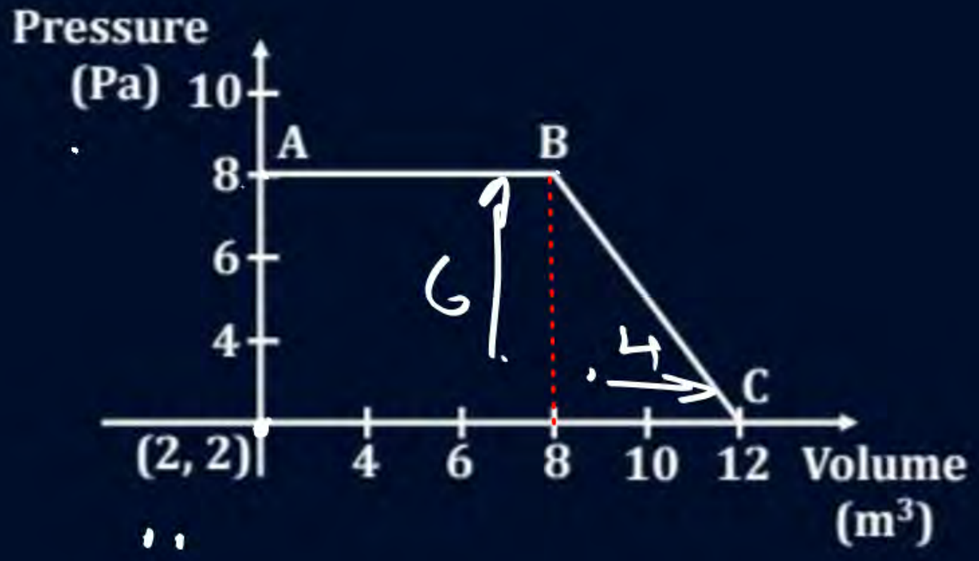
QUESTION

The magnitude of work done by a gas that undergoes a reversible expansion along the path ABC shown in the figure is....

$$|W| = \text{area of sq.} + \text{area of } \Delta$$

$$= 36 + \frac{1}{2} \times 4 \times 6$$

$$= 48 \text{ J}$$



QUESTION

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

$n = 4$

$\Delta T = 200\ K$

$\Delta U = 5000\ J = n C_{v,m} \Delta T$

$5000 = 4 \times C_{v,m} \times 200$

$C_{v,m} = \frac{25}{4} = 6.25\ J\ K^{-1}\ mol^{-1}$

$\Delta U = n C_{v,m} \Delta T$

$J = mol \times C_{v,m} \times K$

$C_{v,m} = J\ K^{-1}\ mol^{-1}$

QUESTION

For two mole of an ideal gas:

$C_p - C_v = 2R$

A $C_v - C_p = R$

B $C_p - C_v = 2R$

C $C_p - C_v = R$

D $C_v - C_p = 2R$

Relation Between P , V & T for Reversible Adiabatic Process

#MIT

$$PV^{\gamma} = K \Rightarrow P_1V_1^{\gamma} = P_2V_2^{\gamma}$$

$$TV^{\gamma-1} = K \Rightarrow T_1V_1^{\gamma-1} = T_2V_2^{\gamma-1}$$

$$TP^{\frac{1-\gamma}{\gamma}} = K \Rightarrow T_1P_1^{\frac{1-\gamma}{\gamma}} = T_2P_2^{\frac{1-\gamma}{\gamma}}$$

Isen. adiabatic expansion of Ideal gas:

Reversible Adiabatic Expansion of an Ideal Gas

#MIT

(1) $\Delta U = n C_{v,m} \Delta T = \frac{nR}{\gamma - 1} \Delta T$

(2) $\Delta H = n C_{p,m} \Delta T$

(3) $q = 0$

(4) $\Delta U = W$

$\frac{C_{p,m}}{C_{v,m}} - \frac{C_{v,m}}{C_{v,m}} = \frac{R}{C_{v,m}}$

$\gamma - 1 = \frac{R}{C_{v,m}}$

$C_{v,m} = \frac{R}{\gamma - 1}$

Polytropic Process

#MIT

① general eqⁿ for all types of Reversible process

$PV^x = K$

ⓐ Isothermal process ∴ $x = 1$

$PV = K \Rightarrow P_1V_1 = P_2V_2$

ⓑ Isobaric process ∴ $x = 0$

$PV^0 = K \Rightarrow P = K$

ⓒ Adiabatic process ∴ $x = \gamma$

$PV^\gamma = K \Rightarrow P_1V_1^\gamma = P_2V_2^\gamma$

ⓓ Isochoric process ∴ $x = \infty$

$PV^\infty = K \Rightarrow P_1V_1^\infty = P_2V_2^\infty$

$\left(\frac{V_2}{V_1}\right)^\infty = \left(\frac{P_1}{P_2}\right) \Rightarrow \left(\frac{V_2}{V_1}\right) = \left(\frac{P_1}{P_2}\right)^{\frac{1}{\infty}}$

$\frac{1}{\infty} = 0$

$\left(\frac{V_2}{V_1}\right) = \left(\frac{P_1}{P_2}\right)^0$

$\frac{V_2}{V_1} = 1 \Rightarrow V_2 = V_1$

QUESTION – (AIIMS 2010)

$C_v = n C_{v,m}$

$-(T_2 - T_1)$

One mole of an ideal gas is allowed to expand reversibly and adiabatically from a temperature of 27°C. If the work done during the process is 3 kJ, then final temperature of the gas is (C_v = 20 J/K)

(A) 100K

(B) 150K

(C) 195K

(D) 255K

Ans $n = 1$

$T_1 = 300K$.

$T_2 = ?$ ↓

$\Delta T = ?$

$w = 3000\,J = \Delta U = n C_{v,m} \Delta T$

$3000 = 1 \times 20 \times \Delta T$

$\Delta T = 150 = T_1 - T_2$

$150 = 300 - T_2$

$T_2 = 300 - 150$

$= 150K.$

QUESTION – (AIIMS 2018, 27 May)

One mole monoatomic gas is expanded adiabatically from 2 L to 10 L at 1 atm external pressure, find ΔU (in atm L)?

(A) −8

(B) 0

(C) −66.7

(D) 58.8

$V_1 = 2L$ $\quad P_{ext} = 1\ atm$

$V_2 = 10L$ $\quad C_{v,m} = \frac{3}{2}R$

$\Delta U = n C_{v,m} \Delta T$

$\Delta U = W = -P_{ext} \cdot \Delta V$

$= -1(8)$

$= -8\ L\,atm$

$\Delta T = T_2 - T_1$

MIT

① for any isobaric process same change in volume V_1 to V_2

$$|W_{rev.}| = |W_{irr.}|$$

② for any other process same change in vol. V_1 to V_2.

ⓐ for expansion

$$|W_{rev.}| > |W_{irr.}|$$

ⓑ for compression

$$|W_{rev.}| < |W_{irr.}|$$

Hess Law

Rxn take place in one step or multiple step

$A \longrightarrow D \quad \Delta H = x\ J$

① $A \longrightarrow B \quad \Delta H_1 = y\ J$

② $B \longrightarrow C \quad \Delta H_2 = z\ J$

③ $C \longrightarrow D \quad \Delta H_3 = w\ J$

$A + B + C \longrightarrow B + C + D$

$A \longrightarrow D$

$\Delta H_1 + \Delta H_2 + \Delta H_3 = \Delta H$

$(y + z + w)J = x\ J$

ΔU ~~~~

ΔH remain same

ΔG ~~~~

ΔS ~~~~

Laws of Thermochemistry

#MIT

① n^{n} add → ΔH add

② n^{n} subtract ⇒ ΔH subtract or n^{n} reverse

① $1A \rightarrow 1B$ $\Delta H_1 = x$ J

② $1D \rightarrow 1E$ $\Delta H_2 = y$ J

Subtract eq ② from eq ① = eq ① + reverse eq ②

$A + E \rightarrow B + D$ $\Delta H = (x - y)$ J

③ S.C. × integer ⇒ ΔH × integer

$\frac{\text{S.C.}}{\text{integer}} \Rightarrow \frac{\Delta H}{\text{integer}}$

$2A \rightarrow 3B$ $\Delta H = 5y$ J

$6A \rightarrow 9B$ $\Delta H = 15y$ J

$A \rightarrow \frac{3}{2}B$ $\Delta H = \frac{5}{2}y$ J

THANK YOU