YAKEEN NEET 2.0

2026

Thermodynamics & Thermochemistry

Physical Chemistry | Lecture -10

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Topics to be covered

1. Medics Test, Revision of Last Class
2. Different Types of Enthalpies, Spontaneous process, 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 !!!

MEDICS

Mastery
Checks your grasp over NEET-level concepts

Evaluation
Judging both knowledge and test-smartness

Decision Making
Testing your speed + accuracy under pressure

Intuition
Some answers need gut + logic – can you spot the trick?

Concepts
It's all about strong basics – no shortcuts here

Strategy
The MEDICS test – built for those who heal, hustle, and hope.

QUESTION

Which of the following pair does show the extensive properties?

A. Temperature and pressure.

B. Viscosity and surface tension.

C. Refractive index and specific heat.

D. Volume and heat capacity.

QUESTION

In a given process on an ideal gas, $dw = 0$ and $dq \leq 0$ Then for the gas,

$dU = \delta q + \delta w$

$dU = \delta q$

$dU < 0$

$dU = -ve$

$U \downarrow \quad T \downarrow$

(A) the temperature will decrease.

(B) the volume will increase.

(C) the pressure will remain constant.

(D) the temperature will increase.

QUESTION

Five moles of an ideal gas is expanded isothermally from 5 dm^3 to 5 m^3 at 300 K. Which of the following is incorrect about the gas?

(A) No heat is absorbed or rejected by the gas.

(B) There is no change in internal energy of the gas.

(C) There is no change in enthalpy of the gas.

(D) Pressure of the gas will decrease by 1000 times.

$n = 5$

$T = 300\ K$

isothermal exp

$V_1 = 5\ dm^3$

$V_2 = 5\ m^3$

$q = 0$

$\Delta U = 0$

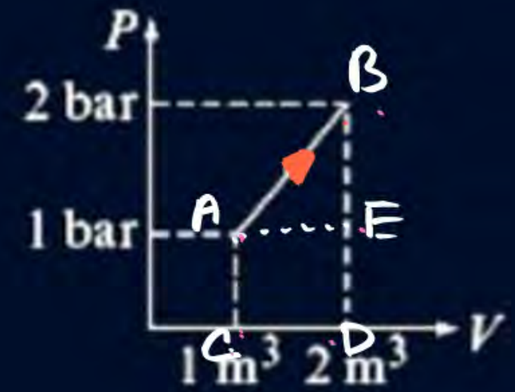
$q = -w$

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

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

QUESTION

A system absorbs 100 kJ heat in the process shown in the figure. What is ΔU for the system?



(A) −50 kJ

(B) +50 kJ

(C) +150 kJ

(D) −150 kJ

$q = +100\ kJ$

$\Delta U = q + w$

$\Delta U = +100 - 150$

$= -50\ kJ$

$w = -(1)^2 + \frac{1}{2} \times 1 \times 1$

$= -1 + \frac{1}{2} = \frac{3}{2}\ bar\,m^3$

$= -\frac{3 \times 10^5}{2 \times 1000}\ kJ$

$= -150\ kJ$

QUESTION

The work done in an adiabatic change of fixed amount of an ideal gas depends on change in

$q = 0$

$\Delta U = W$

$T \uparrow U \uparrow$

$T \downarrow U \downarrow$

A volume

B pressure

C temperature

D density

Next medico test friday

Syllabus → Some basic Concepts of Chemistry
Redox rxn & & Vol. analysis
] → Complete Chapter.

Revision of Last Class

Calorific value of fuel

RE:-

Enthalpy of Neutralisation (ΔH_N)

#MIT

(1) Neutralisation rxn

acid + base ⟶ salt + H_2O

(2) Strong acid + Strong base ⟶ salt + 1 g. eq of H_2O $\Delta H = \Delta H_N$

$\Delta H_N = -57.3$ KJ/mole

ΔH_N Constt. as $1H^+ + 1OH^- \rightarrow 1H_2O$ form

(3) in Case of W.A or W.B $\Delta H_N < |-57.3\,KJ|$ as some heat is used to dissociate W.A or W.B.

(4) HF neutralisation $\Delta H_N > |57.3\,KJ|$ due to high hydration of F^-

$1HCl + 1NaOH \rightarrow 1NaCl + 1H_2O$

$H^+ + Cl^- + Na^+ + OH^- \rightarrow Na^+ + Cl^- + H_2O$

$\Delta H_N = -57.3\ KJ/mol$

$1HCl + 1KOH \rightarrow 1KCl + ,,$

$H^+ + Cl^- + K^+ + OH^- \rightarrow K^+ + Cl^- + H_2O$

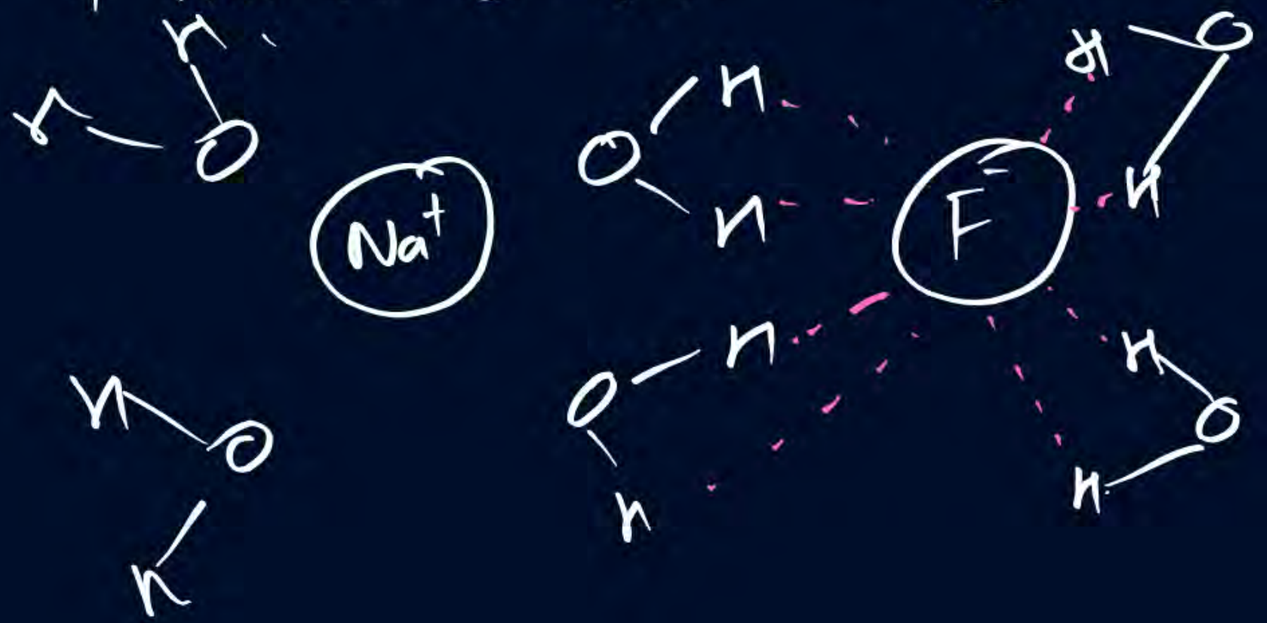
$1HNO_3 + 1KOH \Rightarrow KNO_3 + ,,,,,$

$1H_2SO_4 + 2NaOH \rightarrow 1Na_2SO_4 + 2H_2O \quad \Delta H = 2x - 57.3\ KJ$

$1H_2SO_4 + 1KOH \rightarrow 1KHSO_4 + 1H_2O \quad \Delta H = -57.3\ KJ$

$1HClO_4 + 1NaOH \rightarrow NaClO_4 + H_2O \quad \Delta H = -57.3\ KJ$

$HF + NaOH \rightarrow NaF + H_2O$



QUESTION

If CH_3COOH (1 mole) is completely neutralized by NaOH and heat evolved is 55 kJ/mol. Find enthalpy of ionisation of CH_3COOH?

org. acid → W.A.

S.B.

$|57.3 - 55| = 2.3$ KJ

↓

used in dissociation of CH_3COOH

A. -29.4 kJ

B. -11.8 kJ

C. 29.6 kJ

D. 11.8 kJ

QUESTION

If 1 gram eq. of H_2SO_4 is completely neutralized by aq. KOH (excess). Find Enthalpy change for process?

$g\,eq = 1 = moles \times 2$

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

$\frac{1}{2} H_2SO_4 + 1\,KOH \rightarrow \frac{1}{2} K_2SO_4 + 1\,H_2O \quad \Delta H = -57.3\ kJ$

QUESTION

The enthalpy change for the reaction, $NaOH(aq) + HCl(aq) \rightarrow NaCl(aq) + H_2O(l)$ is –57 kJ. Predict the value of the enthalpy change in the following reaction.

$$Ba(OH)_2(aq) + H_2SO_4(aq) \rightarrow BaSO_4(s) + 2H_2O(l)$$

A. –57 kJ

B. –76 kJ

C. –114 kJ

D. –200 kJ

Q ΔH_N $H_2C_2O_4$ = -25.4 KCal/mol using strong base

find ΔH $H_2C_2O_4 \rightarrow 2H^+ + 1C_2O_4^{2-}$

(a) 2 KCal

(b) 1 KCal

(c) -11.7 KCal

(d) 4 KCal

$H_2C_2O_4 + 2NaOH \rightarrow Na_2C_2O_4 + 2H_2O$

ΔH = -25.4 KCal

-57.3 KJ/mole

= -13.7 KCal/mol

ΔH = -27.4 - (-25.4)

= -2 KCal

ΔH = -13.7 x 2

= -27.4 KCal

Q11

KOH + HCl rise in temp T_1

500ml 500ml $\frac{500}{1000} \times 2$

2M 2M

1 mole 1 mole

$q = m \times \Delta T$

$q = m \times x \, T_1 \Rightarrow T_1 = \frac{q}{mx}$

TLR

KOH + HCl rise in temp T_2

250ml 500ml

2M 2M

$\frac{1}{2}$ mole 1 mole

$\frac{q}{2} = m \times T_2 \Rightarrow T_2 = \frac{q}{2mx}$

(a) $T_1 = T_2$

(b) T_1 is 2 times greater than T_2

(c) T_2 is twice large as T_1

(d) T_1 is 1.5 times large as T_2

$$\frac{q_1}{q_2} = \frac{4}{3} \frac{1000 \times d \times \beta T_1}{750 \times d \times \beta T_2}$$

$$\frac{2 \times 3}{4_2} = \frac{T_1}{T_2}$$

$$\frac{3}{2} T_2 = T_1$$

Q How many ml of 1M KOH & 2M H_2SO_4 required to produce resulting volume of 100ml with highest rise in temp.?

$q = ms\Delta T$

(a) 80, 20
(b) 20, 80
(c) 60, 40
(d) 50, 50

$H_2SO_4 + 2KOH \longrightarrow K_2SO_4 + 2H_2O$

$(100-V) \times 2 \times 2 = V \times 1 \times 1$

$400 - 4V = V$

$400 = 5V$

$V = 80ml$

Q eq. volume of 1 M HCl & 1 M H_2SO_4 neutralised by dilute NaOH by X & Y Kcal of Heat are liberated.

True ?

(a) $X = Y$

(b) $2X = Y$

(c) $X = 2Y$

(d) $4X = Y$

$HCl + NaOH \rightarrow NaCl + H_2O$ $X = x$

$!x! \times 1 = 1$

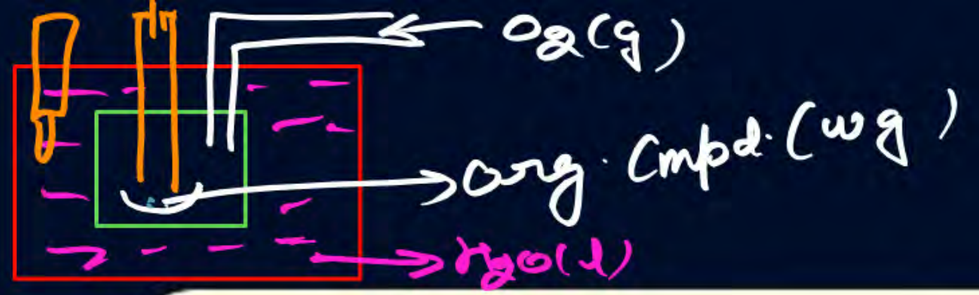
$H_2SO_4 + 2NaOH \rightarrow Na_2SO_4 + 2H_2O$ $Y = 2x$

$!x! \times 2 = 2$

$Y = 2X$

$geq = \not{2} = moles \times \not{2}$

Bomb Calorimeter (B.C.)



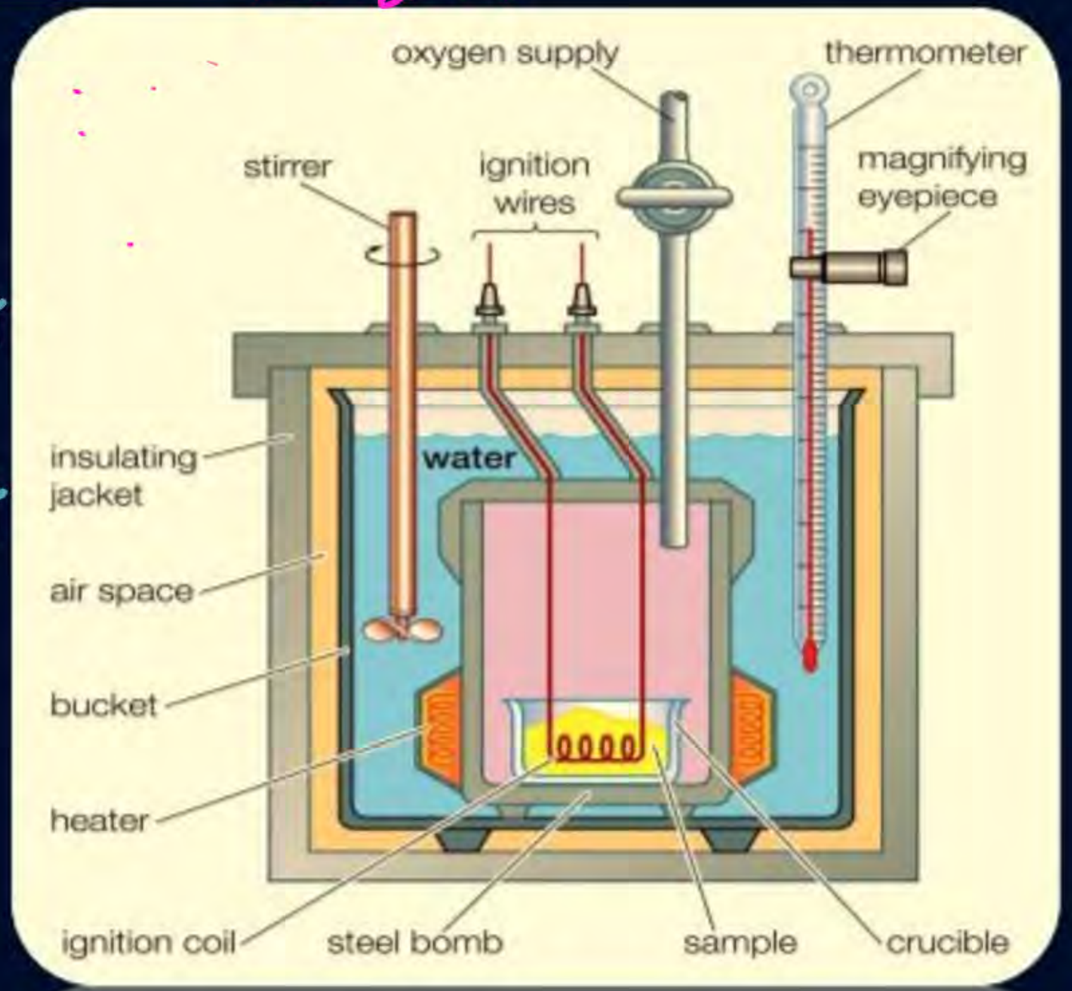
① used to find q_V for Combustion of Organic Cmpd.

② $q_V = \Delta U = (ms)_{H_2O} \Delta T + (ms)_{B.C.} \Delta T$ J

$= \left[(ms)_{H_2O} + (\text{Heat Cap.})_{B.C.}\right] \Delta T$ J

$$q_V = \Delta U = \frac{\left[(ms)_{H_2O} + (\text{Heat Cap.})_{B.C.}\right] \Delta T}{n} \text{ J/mol}$$

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



(3) $q_p = \Delta H = \underline{\Delta U} + \underline{\Delta n_g} RT$

QUESTION

$18\times12+36+32$

$=216+68=284$

CH_3

Stearic acid [$CH_3(CH_2)_{16}CO_2H$] is a fatty acid, the part of fat that stores most of the energy. 1 g of stearic acid was burned in a bomb calorimeter. The bomb has a heat capacity of 652 J/°C. If the temp of 500 g water (c = 4.18 J/g C) rose from 25.0 to 39.3°C, how much heat was released when stearic acid was burned ? {given: $C_p(H_2O) = 4.18$ J/g °C} ↳ J/mole

As $w_{s.c.} = 1g$ $\quad (\text{Heat Cap})_{B.C.} = 652\ J/°C$

$\Delta T = 39.3 - 25$

$= 14.3K$

$w_{H_2O} = 500g$

$C = S = 4.18\ J\,g^{-1}\,{}^{o}C^{-1}$

$$q_V = \Delta U = \frac{\left[\frac{500}{1000} \times 418 + 652\right] 14.3 \times 284}{1}$$

2.09

$$= 654.09 \times 14.3 \times 284 \text{ J/mol}$$

Limitation of First Law of Thermodynamics

(1) does not tell us about direction of Heat.

(2) 100% efficiency is not possible.

$\Delta U = q + w$

$q = 0$

$\Delta U = w$ ↑

Video game ↑

Spontaneous Process

- **Process which takes place on it's own or takes places after initiation.**

Non-spontaneous Process

- **Process which can't take place or they will take place with help of external force and as soon as external force are stopped, process will stop again.**

Factors Affecting Spontaniety

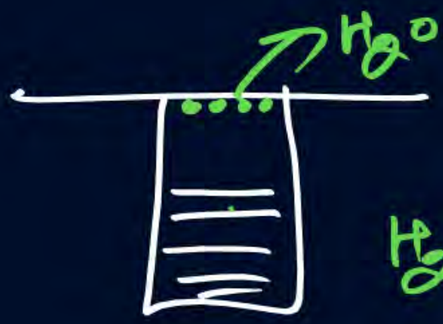
- Tendency for minimum energy
- Tendency for maximum randomness

Tendency for Minimum Energy

Energy ↓ on moving from reactant to Product ⇒ rxn spontaneous.

$$H\cdot + H\cdot \rightarrow H_2 \qquad \Delta H = (-)ve$$

acc. to this factor ⇒ all exothermic rxn spontaneous
& all endothermic rxn all non-spontaneous.



$H_2O(l) \rightarrow H_2O(g)$ $\Delta H = (+)ve$ endothermic

& spontaneous

Home work from modules

Prarambh → Q 54, 55, 62

THANK YOU