YAKEEN NEET 2.0

2026

Ionic Equilibrium

Physical Chemistry | Lecture -02

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Topics *to be covered*

MEDICS test

A Revision of Last Class

B Concepts of Acids & Bases , Ionic product of water.

C Ostwald Dilution Law) Home work from modules.

Rule 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 home work along with DPP.
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.

Rule 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.
7. Don’t watch the videos in high speed if you want to understand better.


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

1 mole of argon is expanded isothermally and irreversibly (not against vaccum) from 10 L to 100 L. Which of the following is incorrect of the process?

$n = 1$ (Ar) irrev. iso. exp.

$\Delta T = 0$ $V_1 = 10\,L$, $V_2 = 100\,L$.

(A) $\Delta U = 0$

(B) $\Delta H = 0$

(C) Heat supplied ✓

(D) $\Delta T = 0$

QUESTION

A vessel contains 100 litres of a liquid X. Heat is supplied to the liquid in such a fashion that, Heat given = change in enthalpy. The volume of the liquid increases by 2 litres. If the external pressure is one atm, and 202.6 Joules of heat were supplied then [U = total internal energy]:

$V_{1X(l)} = 100\,L$

$V_2 = 102\,L$

$q_p = \Delta H \quad \Delta H = q_p = 202.6\ J$

$P_{ext} = 1\ atm$

$w = -P\Delta V$

$= -1 \times 2 \times 101.3\ J = -202.6\ J$

$\Delta U = q + w$

$= +202.6 - 202.6 = 0$

(A) $\Delta U = 0, \Delta H = 0$ ✓

(B) $\Delta U = +202.6\ J, \Delta H = +202.6\ J$

(C) $\Delta U = -202.6\ J, \Delta H = -202.6\ J$ ✗

(D) $\Delta U = 0, \Delta H = +202.6\ J$ ✓

QUESTION

A typical adult needs 33 kcal per kg body weight per day. Assuming an energy balance, calculate the 'power' of an 80 kg individual.

33 KCal / Kg (porridge)

$$P = \frac{80 \times 33 \times 4.2}{24 \times 3600} \text{ J/s} = 128 \text{ W}$$

(A) 217 W

(B) 128 W ✓

(C) 712 W

(D) 172 W

QUESTION

$\gamma = \frac{5}{3}$

A monoatomic gas ($C_V = \frac{3}{2} R$) is allowed to expand adiabatically and reversibly from initial volume of 8 L at 300 K to a volume V_2 at 250 K. V_2 is:

A. 10.5 L

B. 23 L

C. 8.5 L

D. 50.5 L

$V_1 = 8\ L \qquad V_2 = V_2$

$T_1 = 300\ K \qquad T_2 = 250\ K$

$T_1 V_1^{\gamma-1} = T_2 V_2^{\gamma-1}$

$300 \times 8^{1.6-1} = 250 \times V_2^{1.6-1}$

$\frac{6}{5} \times 8^{0.6} = V_2^{0.6}$

$V_2^{0.6} = 1.2 \times 8^{0.6}$

$= 1.2 \times 3.48$

$V_2^{0.6} = 4.176$

QUESTION

When water in a beaker freezes to form ice, then which of the following will be a correct statement :

$H_2O(l) \rightleftharpoons H_2O(s)$

q loss

S ↓

$S_{sys} \downarrow \; S_{surr} \uparrow$

$\Delta S = \frac{q}{T}$

(A) S_{system} decreases whereas $S_{surrounding}$ increases.

(B) S_{system} and $S_{surrounding}$ both increases.

(C) S_{system} increases whereas $S_{surrounding}$ decreases.

(D) S_{system} and $S_{surrounding}$ both decreases.

QUESTION

For a reaction :

$2A(g) + 4B(g) \rightarrow 5C(g) + 2D(l)$ $\Delta E^\circ = 40$ kcal/mole and $\Delta S^\circ = +200$ cal/K mole.

The value of ΔG°_{200} will be :

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

$= 40000 - 1 \times 2 \times 200 = 37600$

$\Delta G^\circ = \Delta H^\circ - T\Delta S^\circ$

$= 39600 - 200 \times 200$

$= -400 = -0.4$ K Cal/mol

1000

(A) 0

(B) +0.4 kcal/mole

(C) –0.4 kcal/mole

(D) –360 kcal/mole

Complete Thermodynamics & Thermochemistry → Test → Wednesday → moderate + tough

Revision of Last Class

C.A $\rightleftharpoons[+H^+]{-H^+}$ C.B

#MIT

S.A. has weak Conj. base & Vice-Versa.

$HCl + H_2O \longrightarrow H^+ + \ddot{Cl}^-$

S.A. — W.B.

$CH_3COOH + H_2O \rightarrow H^+ + CH_3COO^-$

W.A. — S.B.

Lewis Concept of Acids & Bases

(1) Lewis acid :→ (electrophile)
Substance which can accept l.p. of e^-

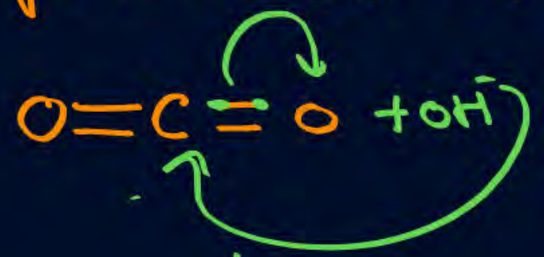
(2) Lewis base :→ (nucleophile)
which can donate l.p. of e^-

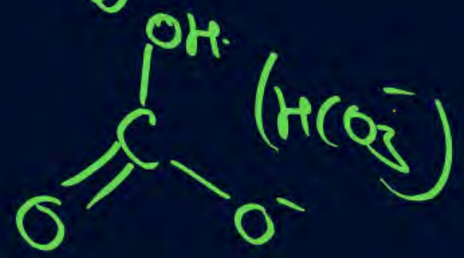
Lewis Acid

#MIT

M C D of India

- Multiple bond with more E.N. element
  for ex :- CO_2, SO_2, SO_3





- Vacant d-orbital → (3rd Period onwards)
  PCl_5, SF_6, IF_7

- Incomplete Octet → BF_3, $AlCl_3$

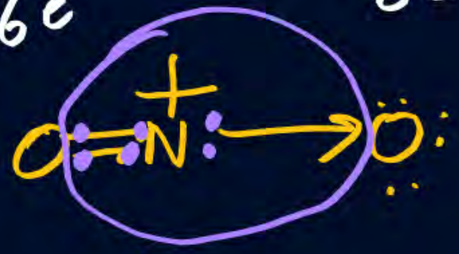
$BF_3 + F^- \rightarrow BF_4^-$

- Cations → H^+, Br^+, Cl^+, NO_2^+, CH_3^+ etc.

$H \rightarrow 1e^-$	$H^+ + 2e^- \rightarrow H^-$
	$0e^-$ $\quad$ $2e^-$

$Br^+ + 2e^- \rightarrow Br^-$

$6e^- \quad 8e^-$



Lewis Base

2 Types

① (-)vely Charged :- Cl^-, Br^-, I^-, OH^-, NH_2^-, NO_3^-

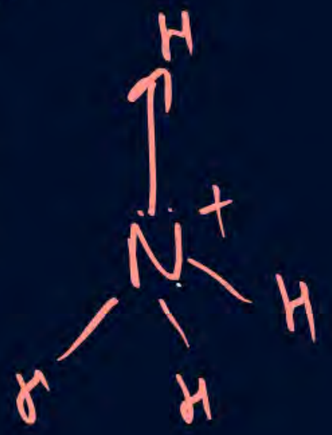
② Neutral but with l.P. of e^- :-

NH_3, H_2O etc.

$NH_3 + H^+ \rightarrow NH_4^+$

L.B. L.A.

Neither lewis acid nor lewis base



QUESTION – (AIPMT 2011)

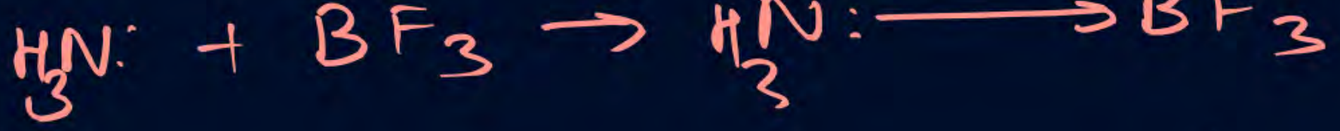
Which of the following is least likely to behave as Lewis base?

(A) $H_2\ddot{O}:$

(B) $:NH_3$

(C) BF_3

(D) OH^-



QUESTION – (NCERT Exemplar)

Acidity of BF_3 can be explained on the basis of which of the following concepts?

A. Arrhenius concept

B. Bronsted Lowry concept

C. Lewis concept

D. Bronsted Lowry as well as Lewis concept

QUESTION – (AIPMT 2010)

Which one of the following molecular hydrides acts as a Lewis acid?

A NH_3

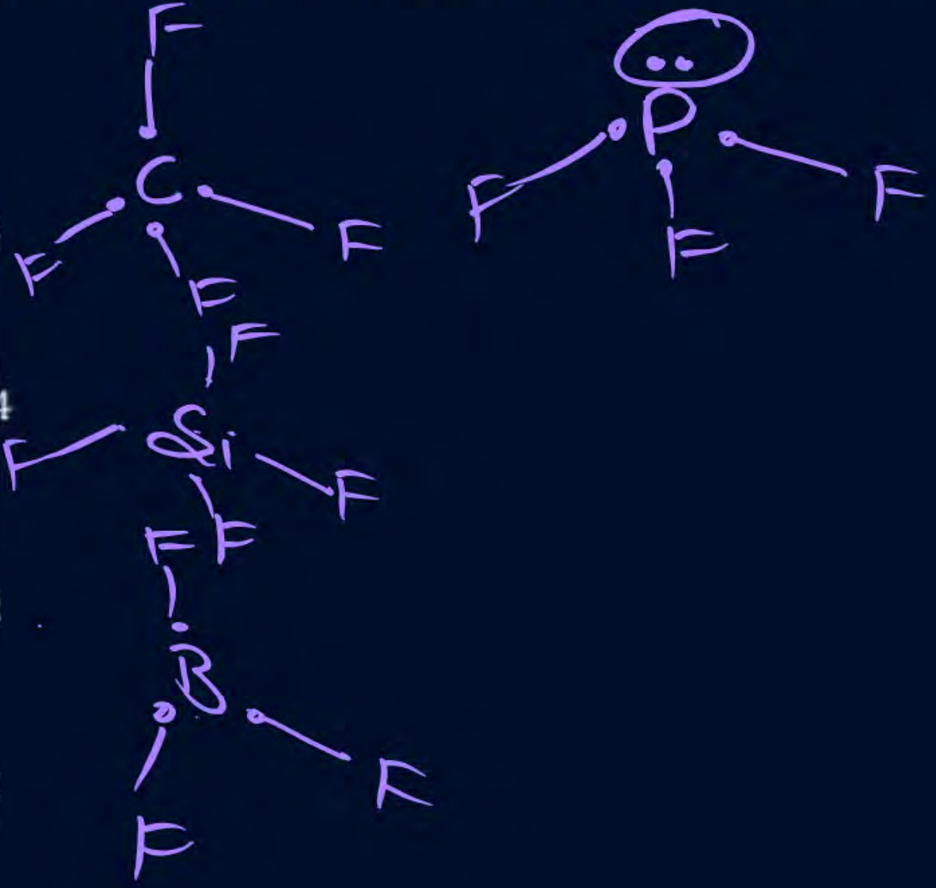
B H_2O

C B_2H_6

D CH_4

QUESTION – (NEET 2016-II)

Which of the following fluoro-compounds is most likely to behave as a Lewis base?



(A) CF_4

(B) SiF_4

(C) BF_3

(D) PF_3

QUESTION – (NEET 2013)

Which of these is least likely to act as a Lewis base?

(A) CO

(B) F^-

(C) BF_3

(D) PF_3

Electrolyte

- **Substance which dissociate in water to give ions**

$$HCl(g) + H_2O(l) \longrightarrow H_3O^+(aq.) + Cl^-(aq.)$$

Strong Electrolyte → $\alpha = 1$

- **Substance which dissociate completely into ions in water.**

For Ex.:- $NaCl$, Na_2SO_4 etc.

$$NaCl + H_2O \longrightarrow Na^+(aq.) + Cl^-(aq.)$$

Weak Electrolyte

$\alpha < 1$

- **Substance which do not dissociate completely in water into ions.**

For Ex.:- HCOOH, CH_3COOH, HCN etc.

NH_4OH)

$$CH_3COOH + H_2O \longrightarrow CH_3COO^- + H^+$$

Ostwald Dilution Law

Weak electrolyte → $\alpha < 1$

- Weak acid
- Weak base

$x = c\alpha$

$$CH_3COOH + H_2O \rightleftharpoons CH_3COO^- + H^+$$

	CH_3COOH	H_2O (l)	CH_3COO^-	H^+
$t=0$	C		0	0
$t=t$	$C-x$		x	x
	$C-C\alpha$		$C\alpha$	$C\alpha$
	$C(1-\alpha)$			

$$K_C = \frac{[CH_3COO^-]^1[H^+]^1}{[CH_3COOH]^1[H_2O]^1}$$

$$K_C[H_2O] = K_a = \frac{[CH_3COO^-][H^+]}{[CH_3COOH]}$$

K_a → Dissociation Constt of acid or Ionisation

$$K_a = \frac{\cancel{C}\alpha \times C\alpha}{\cancel{C}(1-\alpha)}$$

$$K_a = \frac{C\alpha^2}{1-\alpha}$$

$$NH_4OH + H_2O \rightleftharpoons NH_4^+ + OH^-$$

NH_4OH	H_2O	NH_4^+	OH^-
C		0	0
$C-C\alpha$		$C\alpha$	$C\alpha$

$$K_b = \frac{[NH_4^+][OH^-]}{[NH_4OH]} = \frac{\cancel{C}\alpha \times C\alpha}{\cancel{C}(1-\alpha)} = \frac{C\alpha^2}{1-\alpha}$$

K_b → Dissociation constt base or Ionisation " "

MIT

weak acid

$K_a = \frac{c\alpha^2}{1-\alpha}$ $\alpha > 0.05$ or % age dsctn > 5%

or

$\frac{K_a}{C} > 25 \times 10^{-4}$

if $\alpha \leq 0.05$ or % age dissociation $\leq 5\%$

$\alpha << 1$

then $1-\alpha \approx 1$ or $\frac{K_a}{C} \leq 25 \times 10^{-4}$

$K_a = c\alpha^2$

$\alpha = \sqrt{\frac{K_a}{C}}$

weak base

$K_b = \frac{c\alpha^2}{1-\alpha}$ $\alpha > 0.05$ or % age dsctn > 5%

$\frac{K_b}{C} > 25 \times 10^{-4}$

if $\alpha << 1$ $\alpha \leq 0.05$ or % age dissociation $< 5\%$

$1-\alpha \approx 1$ or $\frac{K_b}{C} \leq 25 \times 10^{-4}$

$K_b = c\alpha^2$

$\alpha = \sqrt{\frac{K_b}{C}}$

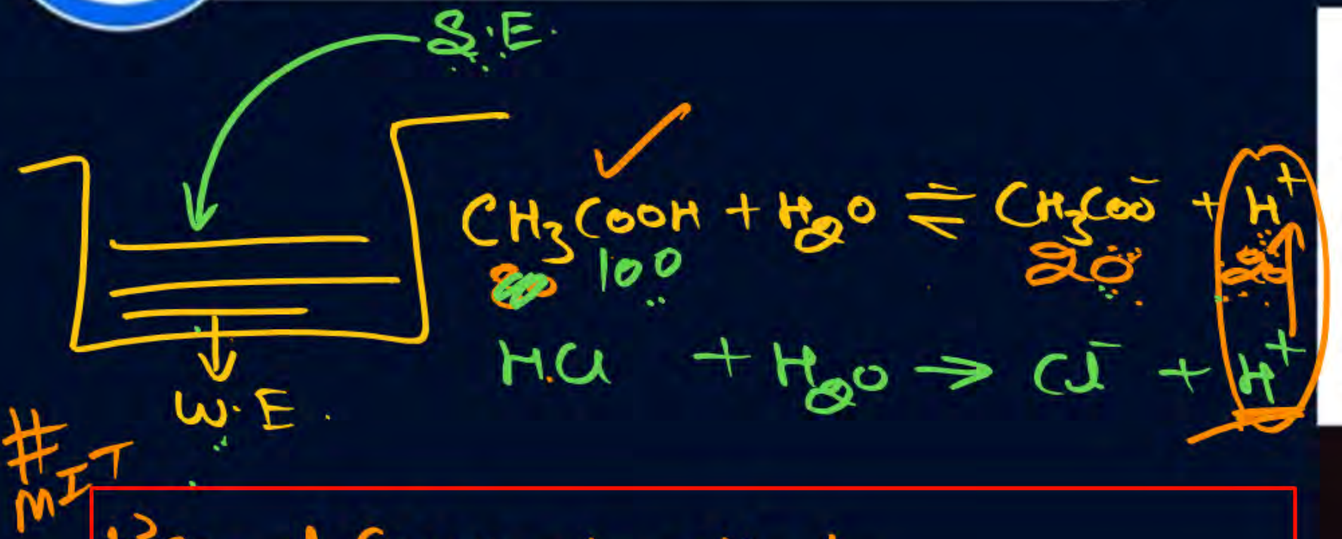
Factors Affecting Degree of Dissociation (α)

$CH_3COOH + H_2O \rightleftharpoons CH_3COO^- + H^+$

There are Five type:

- **Nature of Solute:** ÷ W.E. $\alpha < 1$ S.E. $\alpha = 1$
- **Nature of Solvent** ÷ Solvent Dielectric Constt: ↑ α ↑
- **Temperature** ÷ T ↑ ∴ α ↑
- **Degree of Dilution** ÷ V ↑ C ↓ ∴ ions ↑ ∴ α ↑
- **Common ion Effect**

Common ion Effect



b'cos of Common ion effect

eq. shift backward sn.

$[W.E.]_{initial} = [W.E.]_{eq.}$

$[Common\ ion]_{Total\ Conc.} = [Common\ ion]_{S.E.}$

*When a strong electrolyte is added to a solution of weak electrolyte having a common ion

Le Chatelier:

*When a strong electrolyte is added to a solution of weak electrolyte having a common ion

Weak electrolyte :

QUESTION

Find α for 0.1 M CH_3COOH if $K_a = 18 \times 10^{-9}$.

Ans $\alpha = ?$

$C = 0.1\,M$

$K_a = 18 \times 10^{-9}$

$$\frac{K_a}{C} = \frac{18 \times 10^{-9}}{10^{-1}} = 18 \times 10^{-8} < 25 \times 10^{-4}$$

$$\alpha = \sqrt{\frac{18 \times 10^{-9}}{10^{-1}}} = \sqrt{18 \times 10^{-8}}$$

$$= \sqrt{18} \times 10^{-4}$$

QUESTION

The K_a of a weak monobasic acid is 1×10^{-5}. The percentage of ionization in a decimolar acid solution is:

(A) 0.1%

(B) 10%

(C) 0.5%

(D) 1%

$\uparrow 1H^+$

$\frac{1}{10}$

$K_a = 10^{-5}$

$C = \frac{1}{10}$ M

$\% \text{ age } \alpha = \alpha \times 100$

$= 10^{-2} \times 100 = 1\%$

$\frac{K_a}{C} = \frac{10^{-5}}{10^{-1}} = 1 \times 10^{-4} < 25 \times 10^{-4}$

$\alpha = \sqrt{\frac{K_a}{C}} = \sqrt{\frac{10^{-5}}{10^{-1}}} = \sqrt{10^{-4}} = 10^{-2}$

QUESTION

Degree of dissociation of 0.1N CH_3COOH is: (Dissociation constant = 1×10^{-5})

A 10^{-5}

B 10^{-4}

C 10^{-3}

D 10^{-2}

$N = M \times n_f$

$N = M$

$C = 0.1M$

$\alpha = \sqrt{\frac{K_a}{C}} = \sqrt{10^{-4}} = 10^{-2}$

QUESTION

If α is the degree of ionization, C the concentration of a weak electrolyte and K_a the acid ionization constant, then the correct relationship between α, C and K_a is:

$$\alpha = \sqrt{\frac{K_a}{C}}$$

(A) $\alpha^2 = \sqrt{\frac{K_a}{C}}$

(B) $\alpha^2 = \sqrt{\frac{C}{K_a}}$

(C) $\alpha = \sqrt{\frac{C}{K_a}}$

(D) $\alpha = \sqrt{\frac{K_a}{C}}$

(a) multiplication, numbers

(b) Squaring numbers.

(c) Cube root of perfect Cubes

(d) Square ,, ,, ,, square

(e) Square ,, ,, imperfect ,,

(f) Cubing numbers

$a^3 + a^3 \times \frac{b}{a}$ $a^2b \times \frac{b}{a}$ $b^2a \times \frac{b}{a}$

$2a^2b$ $2ab^2$

THANK YOU