

PRAIYAS

JEE 2026

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PHYSICAL CHEMISTRY

REDOX REACTION

Lecture – 01

FAISAL RAZAQ





Topics to be covered

- A** Concept of Oxidation and Reduction
- B** Oxidation State

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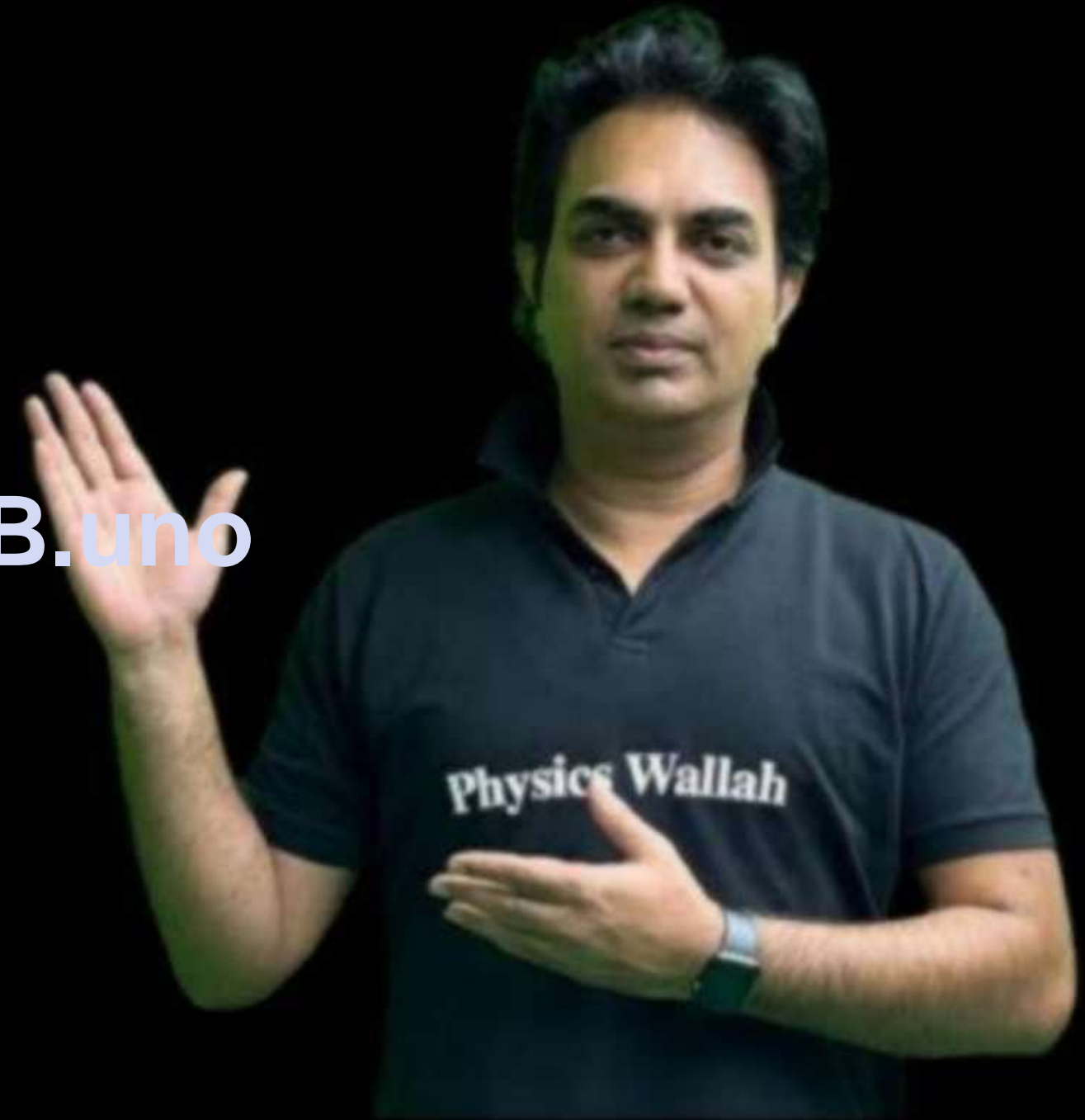




TELEGRAM GROUP BY FAISAL SIR



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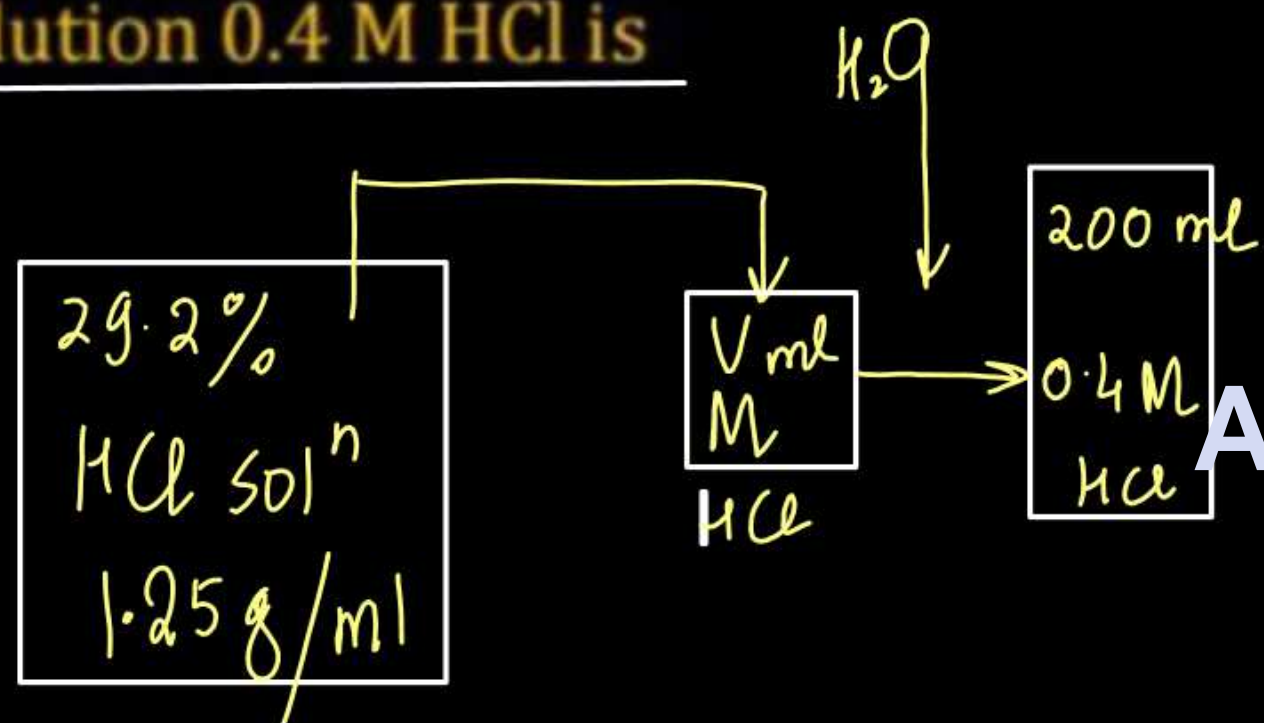


JEE Adv. 2012

$$M \times V = 200 \times 0.4$$



29.2% (w/W) HCl stock solution has density of 1.25 g mL^{-1} . The molecular weight of HCl is 36.5 g mol^{-1} . The volume (mL) of stock solution required to prepare a 200 mL solution 0.4 M HCl is



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29.2 gm HCl in 100 gm solution
 wt of solute wt of solution

$$\text{Molarity} = \frac{\left(\frac{29.2}{36.5}\right) \times 1000}{\left(\frac{100}{1.25}\right)} = 10 \text{ M}$$

$$10 \times V = 0.4 \times 200$$

$$V = 8 \text{ ml}$$

[Ans : 8]

Question

A commercially sold conc. HCl is 35% HCl by mass. If the density of this commercial acid is 1.46 g/ml, the molarity is -

[JEE Main - 2022]

A) 10.2 M

B) 12.5 M

C) 14.0 M

D) 18.2 M

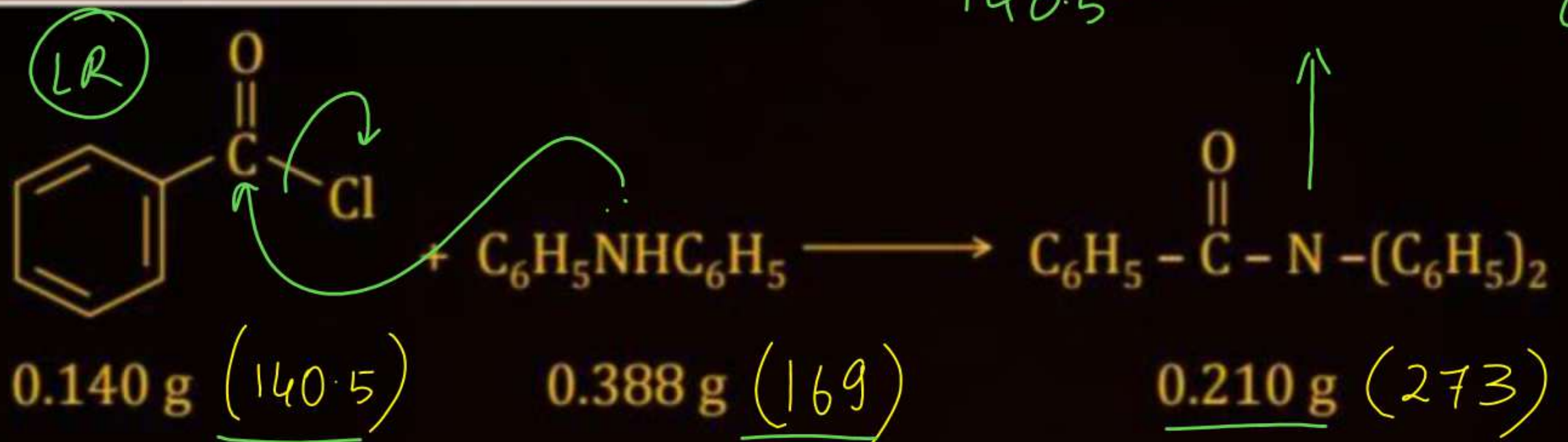
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(C)

JEE Main-17 March, 2021 Shift-II

$$\frac{0.140}{140.5} \times 273 = 0.272 \text{ g}$$

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Consider the above reaction. The percentage yield of amide product is _____.
(Round off to the nearest integer).

(Given : Atomic mass : C : 12.0 u, H : 1.0 u, N : 14.0 u, O : 16.0 u, Cl : 35.5 u)

$$\% \text{ yield} = \frac{0.210}{0.272} \times 100 \approx 77\%$$



Question

A 6.9 M solution of KOH has in water has 30% by weight of KOH. Calculate the density of solution.

1

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[Ans : 1.288]

JEE Main-07 Jan, 2020 Shift-II

The ammonia (NH_3) released on quantitative reaction of 0.6g urea (NH_2CONH_2) with sodium hydroxide (NaOH) can be neutralized by

- A** 100 mL of 0.1 N HCl
- B** 100 mL of 0.2 N HCl
- C** 200 mL of 0.2 N HCl
- D** 200 mL of 0.4 N HCl

3

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Complete combustion of 3g of ethane gives $x \times 10^{22}$ molecules of water. The value of x is _____ . (Round off to the nearest integer)

[Use : $N_A = 6.023 \times 10^{23}$; Atomic masses in u : C 12.0, O : 16.0 ; H : 1.0]

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5g of zinc is treated separately with an excess of

(A) Dilute hydrochloric acid and

(B) Aqueous sodium hydroxide.

The ratio of the volumes of H_2 evolved in these two reactions is :

5

A 1 : 4

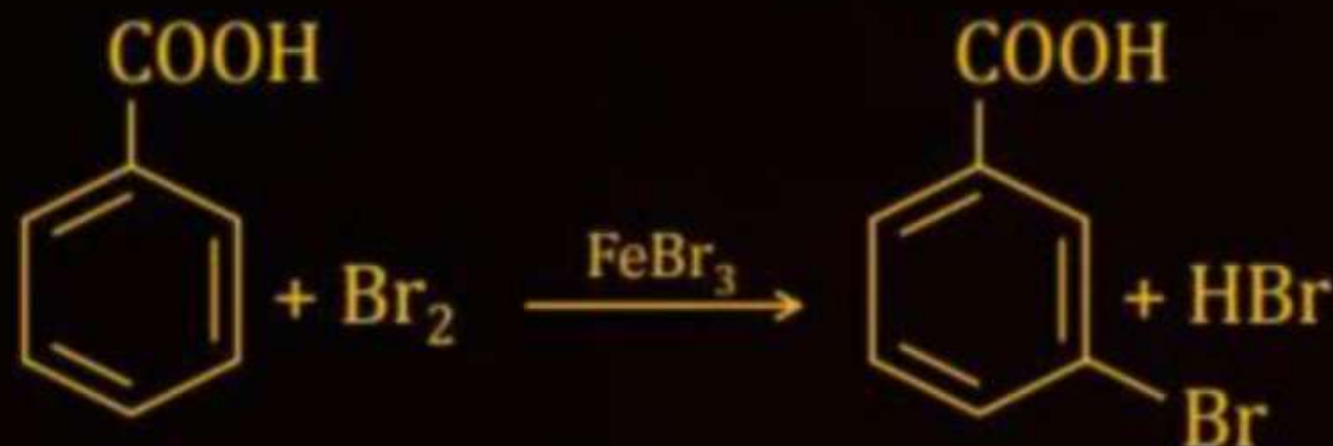
B 1 : 1

C 1 : 2

D 2 : 1

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JEE Main-18 March, 2021 Shift-II



7

Consider the above reaction where 6.1 g of Benzoic acid is used to get 7.8 g of m-bromo benzoic acid. The percentage yield of the product is _____. (Round off to the nearest integer).

[Given : Atomic masses : C : 12.0 u, H : 1.0 u, O : 16.0 u, Br : 80.0 u]

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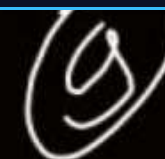


The first and second ionisation enthalpies of a metal are 496 and 4560 kJ mol^{-1} , respectively. How many moles of HCl and H_2SO_4 , respectively, will be needed to react completely with 1 mole of the metal hydroxide?

- A** 1 and 1
- B** 1 and 2
- C** 2 and 0.5
- D** 1 and 0.5

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_____ grams of 3-Hydroxy propanal (MW = 74) must be dehydrated to produce 7.8 g of acrolein (MW = 56) (C_3H_4O) if the percentage yield is 64. (Round off to the nearest integer).

[Given : Atomic masses : C : 12.0 u, H : 1.0 u, O : 16.0 u]

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JEE Main-27 August, 2021 Shift-II

10



100 g of propane is completely reacted with 1000 g of oxygen. The mole fraction of carbon dioxide in the resulting mixture is $x \times 10^{-2}$. The value of x is _____. (Nearest integer)

[Atomic weight : H = 1.008; C = 12.00; O = 16.00]

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JEE Main-24 Feb, 2021 Shift-II

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The formula of a gaseous hydrocarbon which required 6 times of its own volume of O_2 for complete oxidation and produces 4 times its own volume of CO_2 is C_xH_y . The value of y is _____.

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OLD CONCEPT OF OXIDATION



(a) Oxidation is a chemical reaction in which oxygen is added



(b) Hydrogen is removed i.e. hydrogen becomes less



(c) Electronegative element is added



(d) Electropositive element is removed



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OLD CONCEPT OF REDUCTION



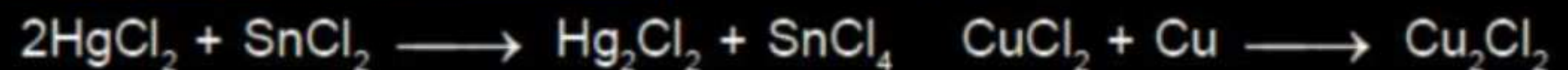
(a) Hydrogen is added. For example



(b) Oxygen is lost. For example



(c) Electropositive element is added. For example



(d) Electronegative element is removed. For example

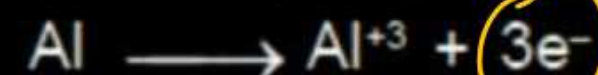


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MODERN CONCEPT OF OXIDATION

[electron gain = reduction]
[electron loss = oxidation]

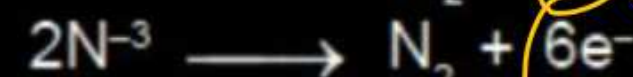
(a) Neutral atom : When a neutral atom loses electron, it gets converted to a positive ion.



(b) Cation : When a cation loses electron, there is an increase in its positive charge.



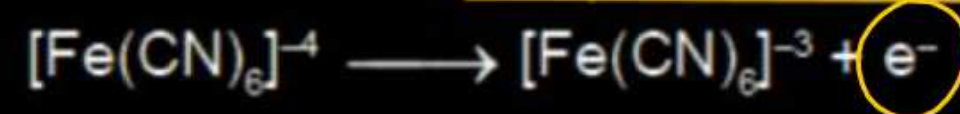
(c) Anion : When an anion loses electron equal to its negative charge, it gets converted to a neutral atom.



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(d) **Complex Anion** : When a complex anion loses electron, its negative charge decreases.



(e) **Molecule** : When a molecule loses electrons, it breaks up into its constituents.



Therefore in oxidation reactions—

- (i) Positive charge increases and negative charge decreases
- (ii) Oxidation number increases

oxidation.

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electron gain = Reduction

MODERN CONCEPT OF REDUCTION

(a) **Neutral Atom** : When a neutral element or atom accepts electrons it gets converted into an anion.



(b) **Cation** : When a cation accepts electron equal to its charge, it gets converted into a neutral atom.



(c) Similarly, when a cation accepts less electrons than its charge, its positive charge decreases. For example



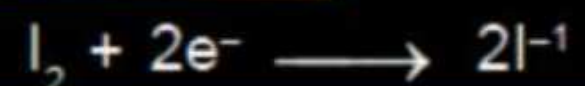
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(d) **Anion** : When an anion accepts electron, its negative charge increases.



(e) **Molecule** : When a molecule accepts electron, it is a reduction reaction.

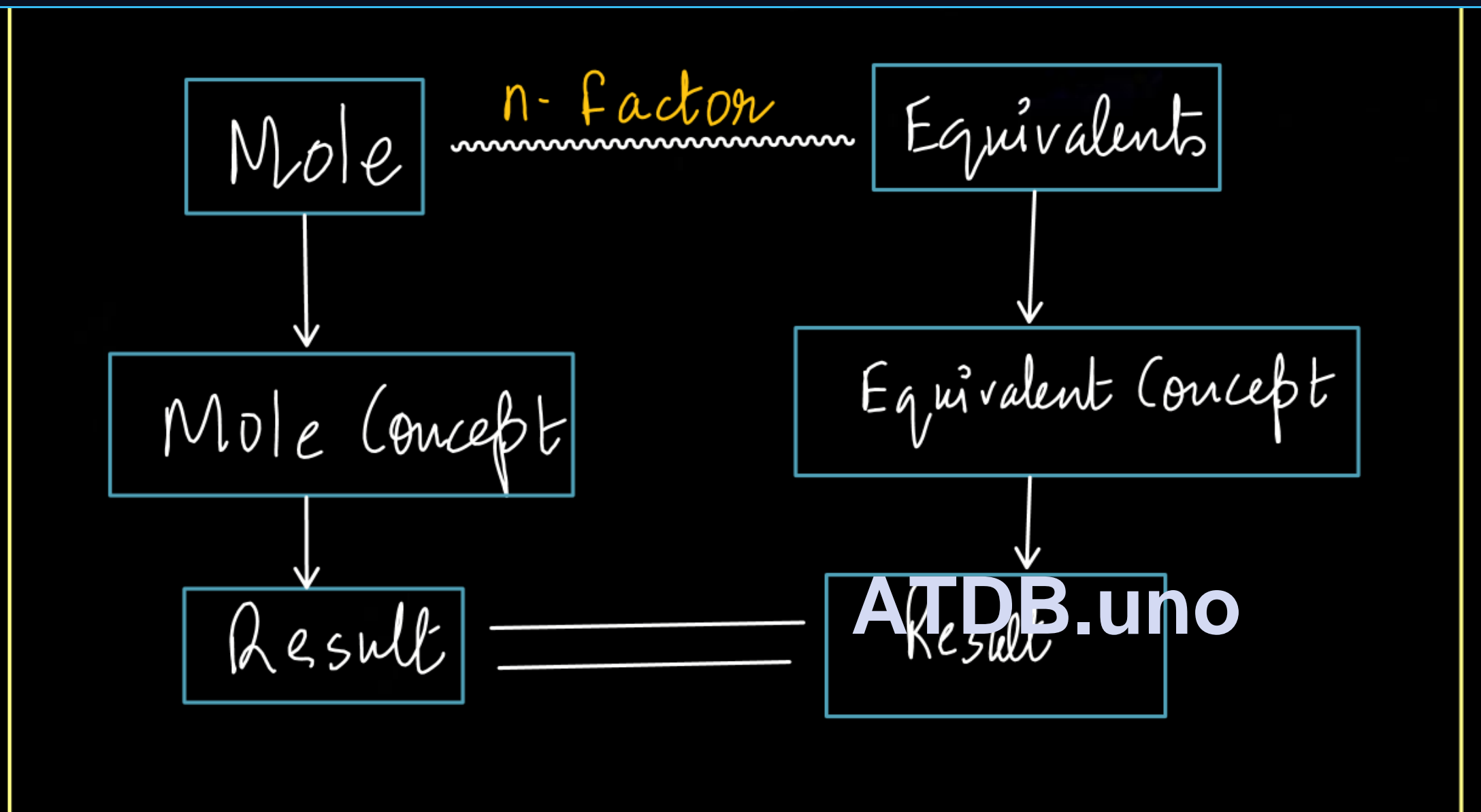


Therefore in reduction reactions—

- (i) Positive charge decreases and negative charge increases
- (ii) Oxidation number decreases

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Redⁿ



Redox



$$\text{moles} \times n\text{-factor} = \text{Equivalents}$$

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n-factor calculations for acids



n-factor = replaceable H^+ ions

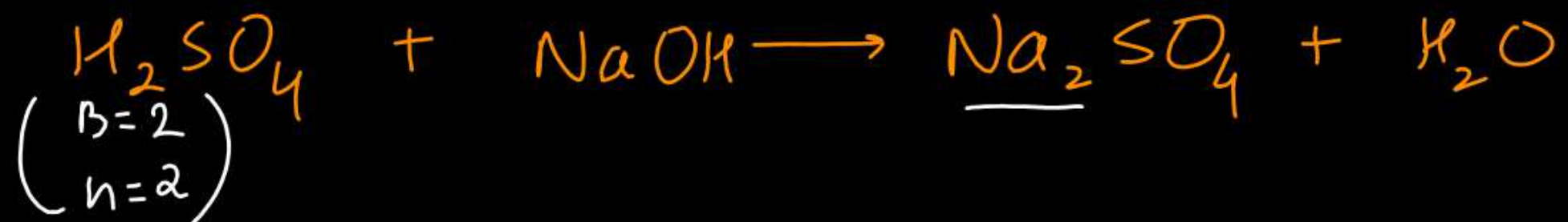
Maximum replaceable H^+ ions of an acid = Basicity of acid.

Example Suppose **ATDB.uno** maximum replaceable H^+ ions in an acid are 3.

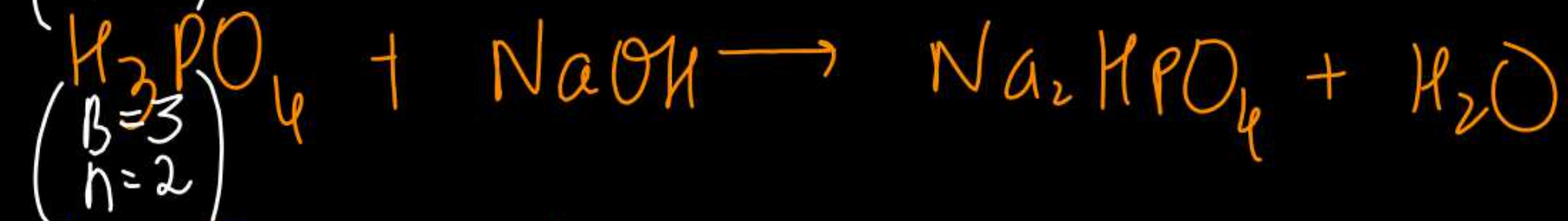
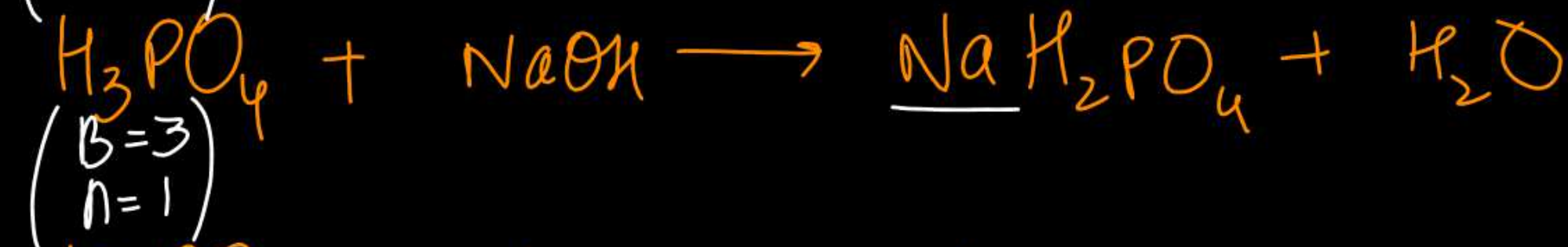
basicity = 3

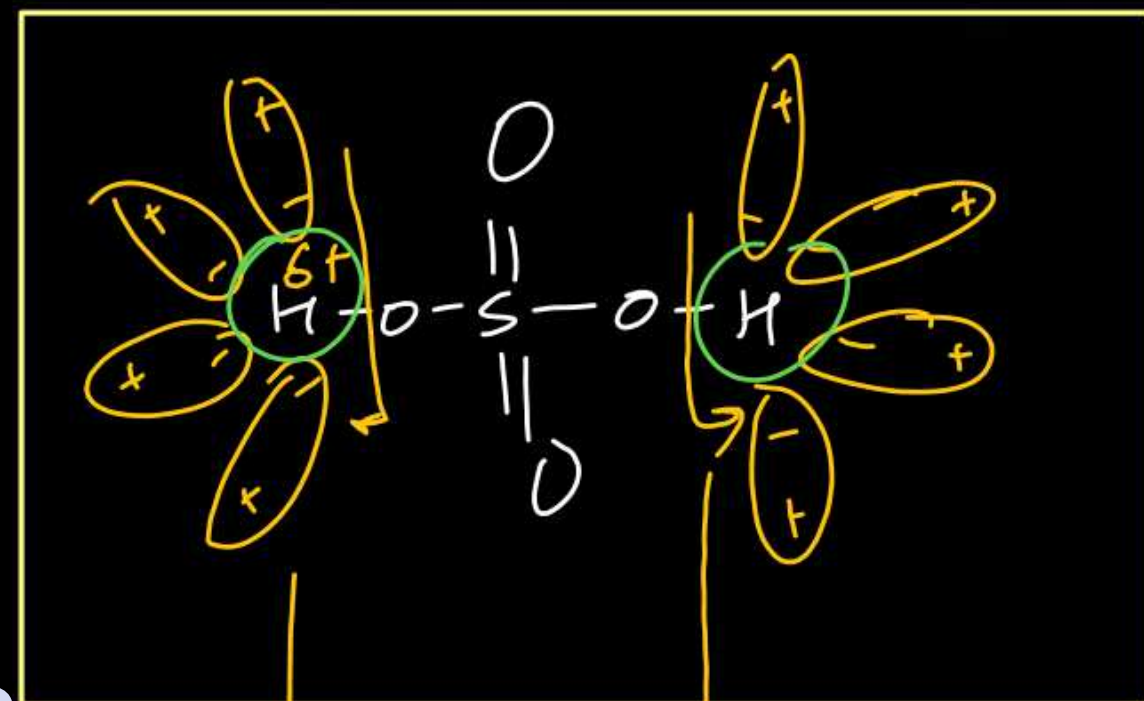
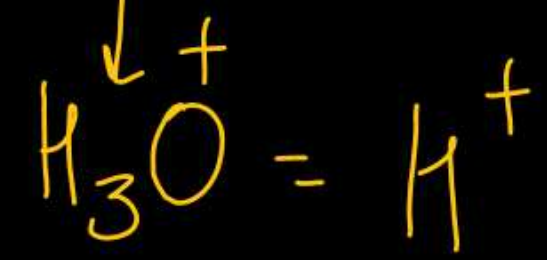
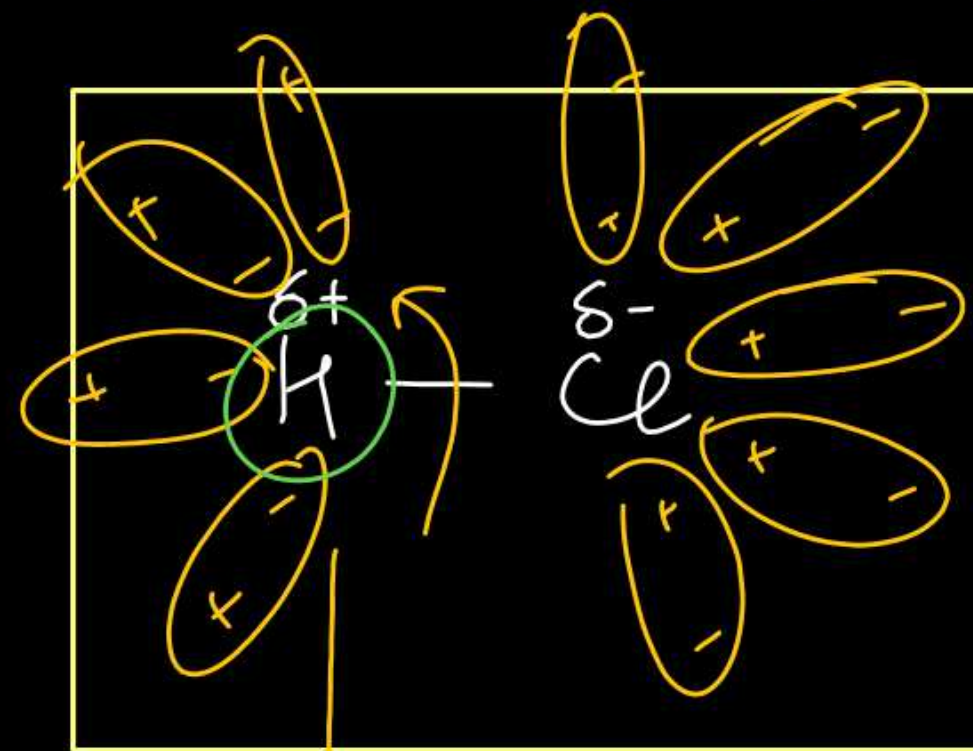
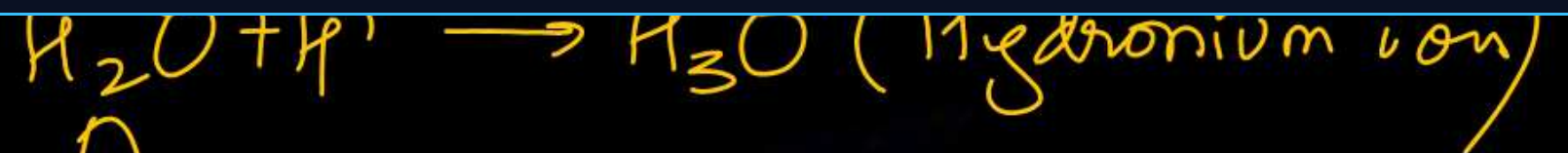
n-factor = 1, 2, 3

Example:

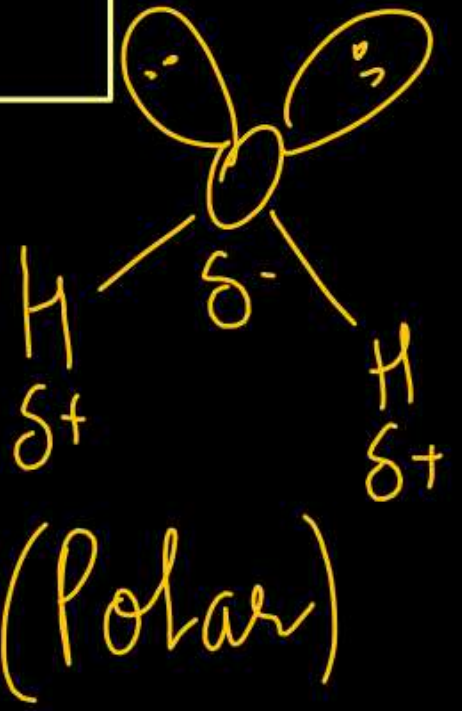
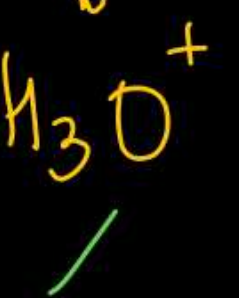
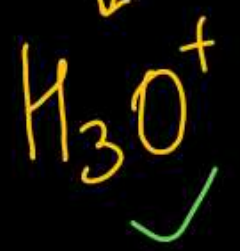


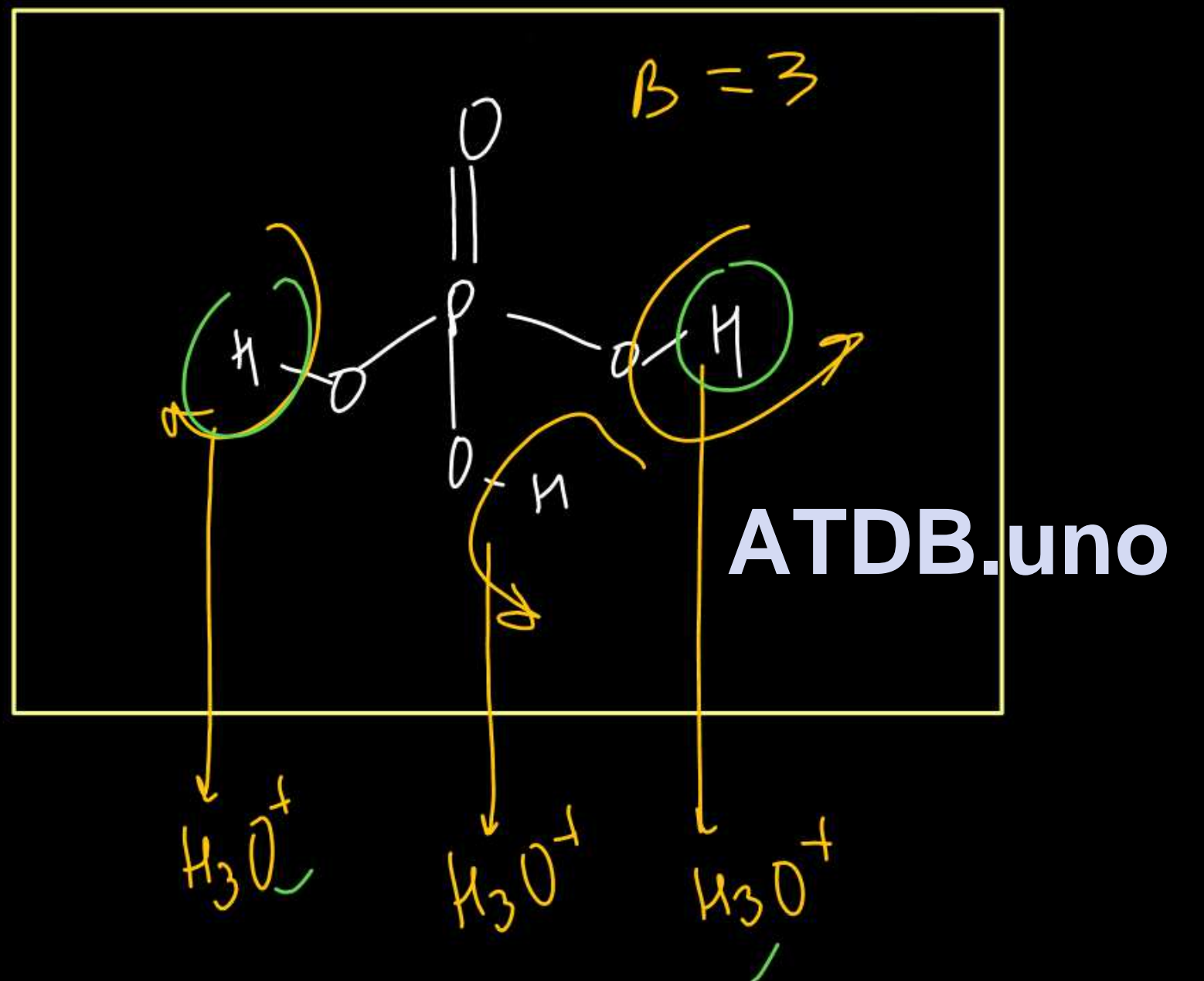
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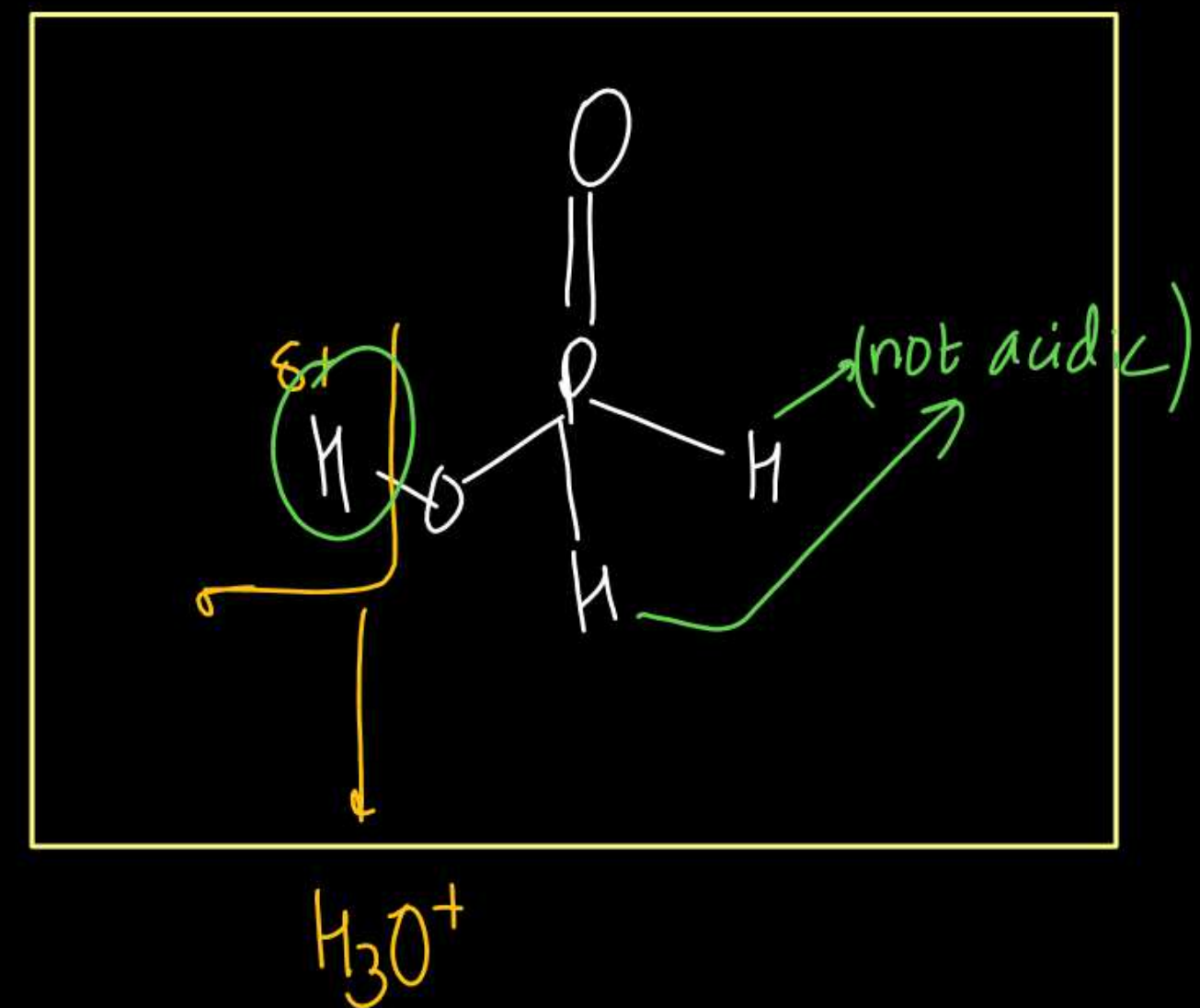
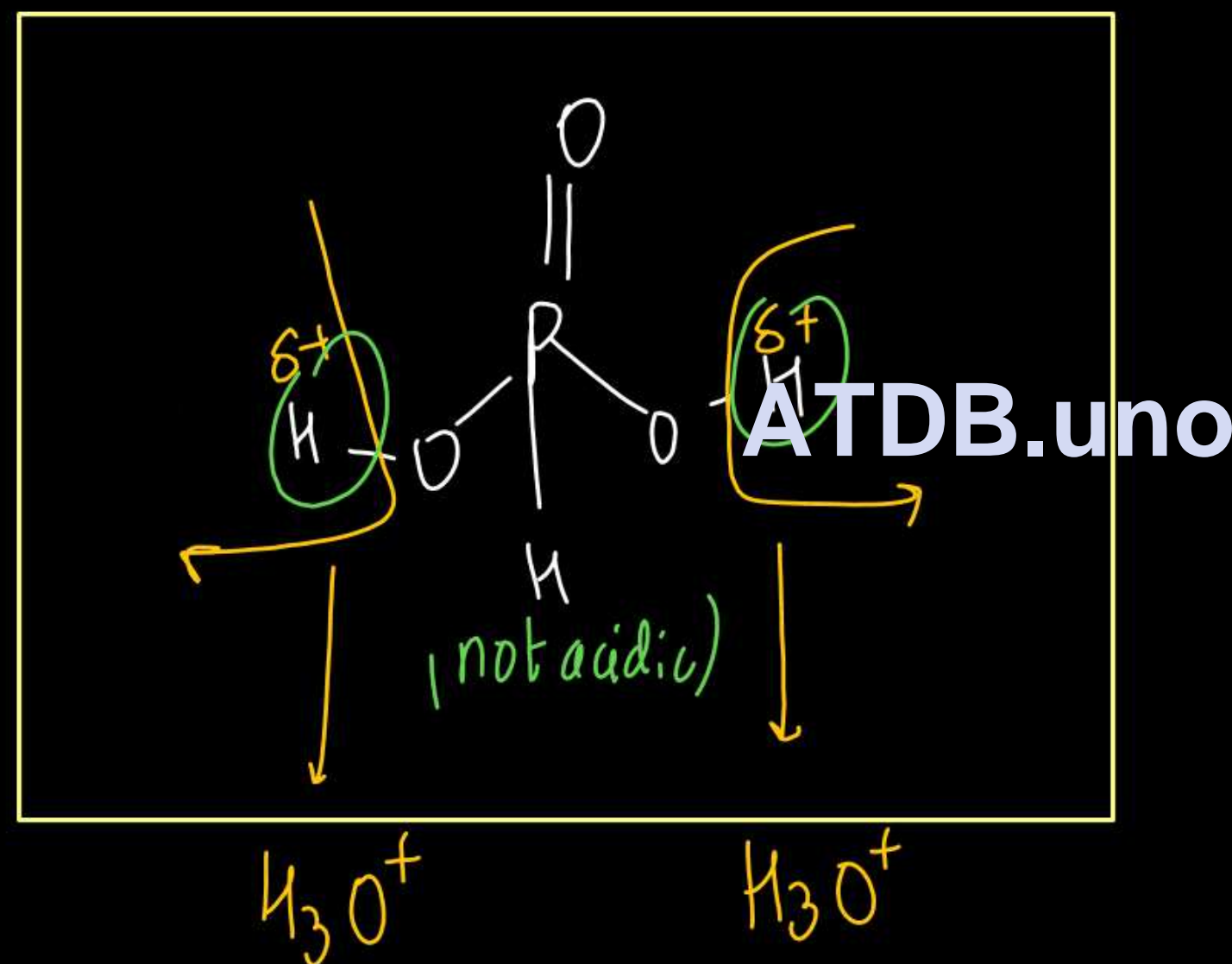
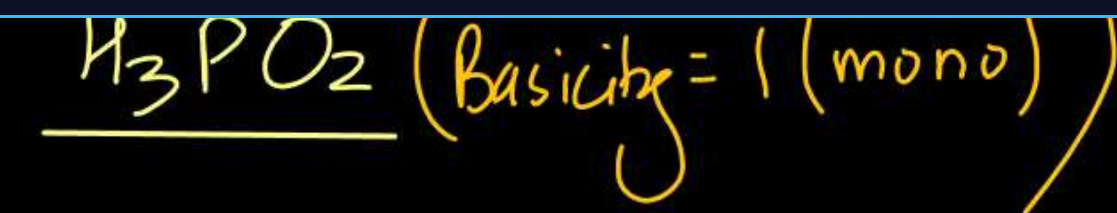
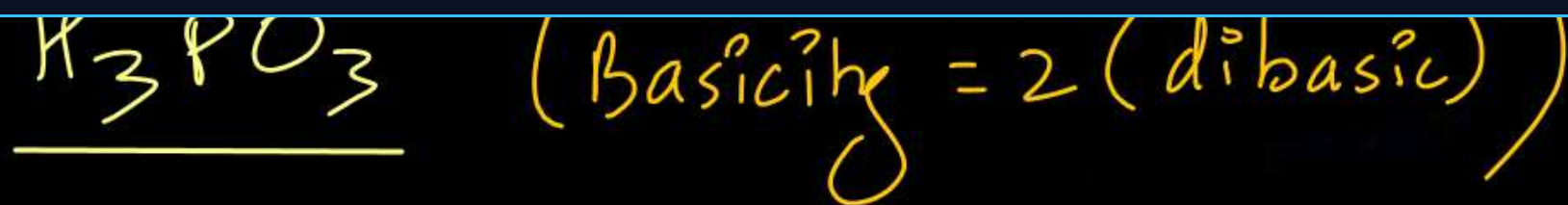




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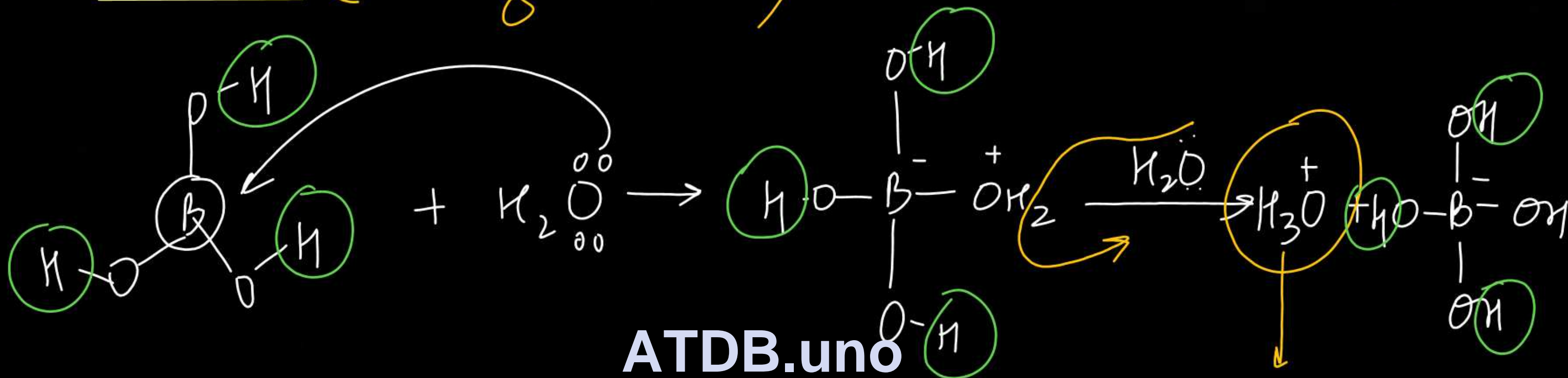




Question

which rxⁿ is possible?







Module - 1H.W.

Prarambh and Prabal

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THANK
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YOU