(#) Condition of Tautomerism:

$$B \overset{||}{\underset{A}{C}} \quad SP^3 \quad H/D/T \quad \rightleftharpoons \quad \overset{B-H}{\underset{A}{C}}$$

$$(E_B > E_A)$$
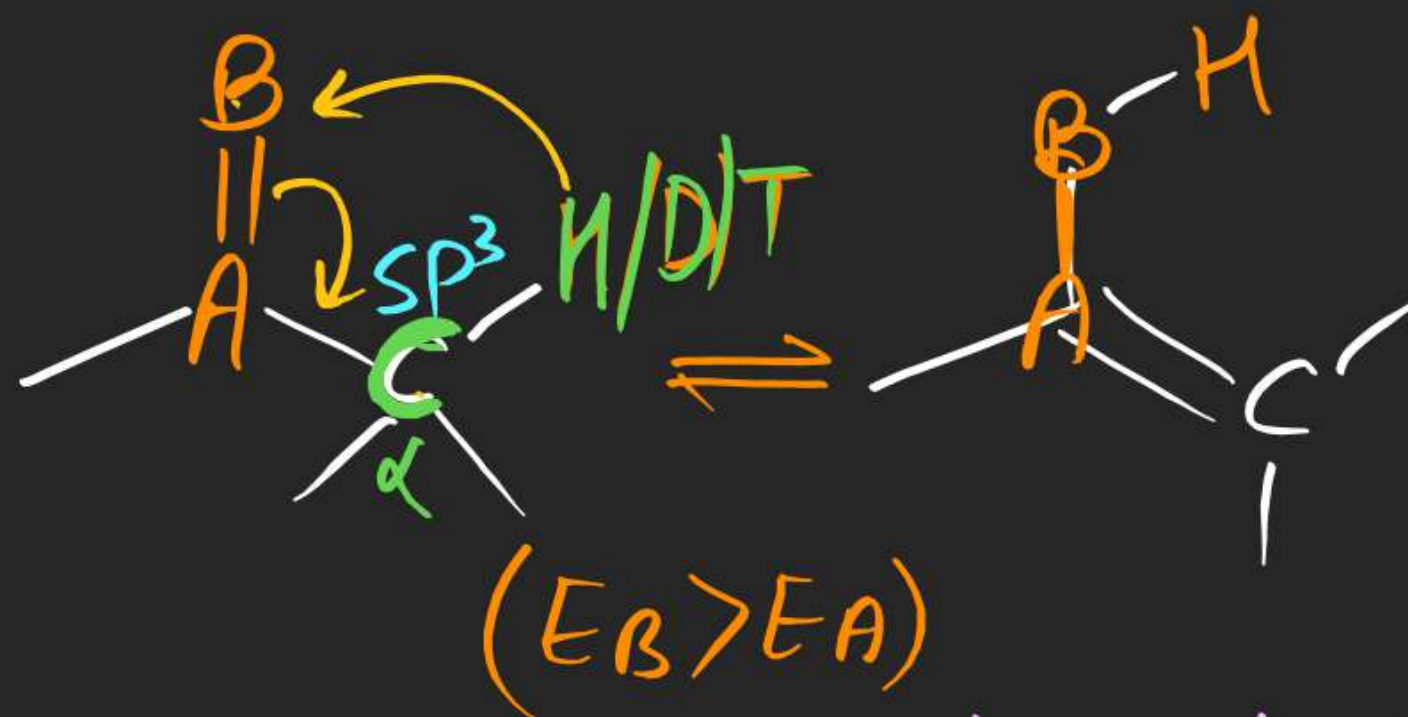
Ex: Identify compounds which can show tautomerism. & also draw its First two stable tautomers.
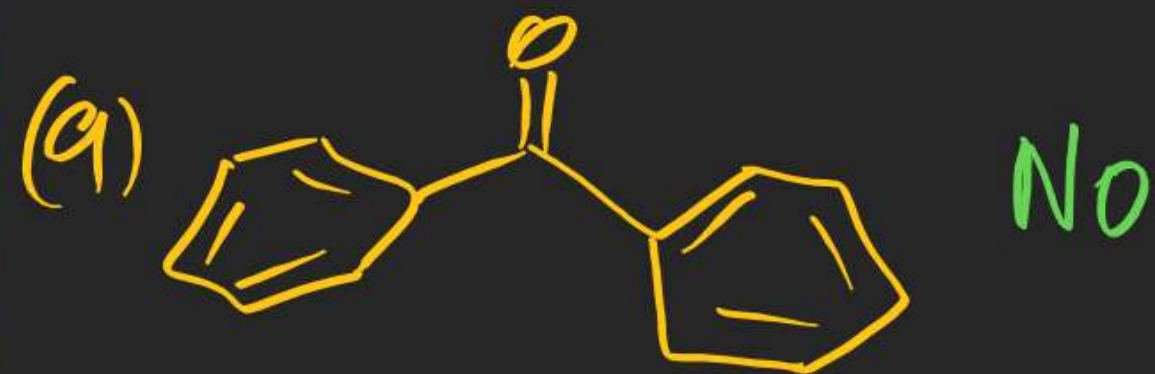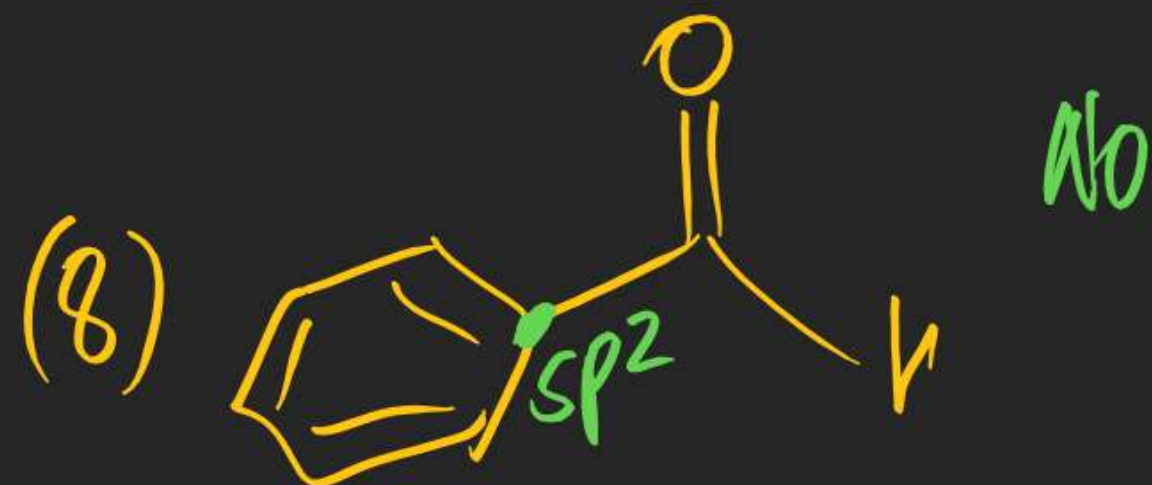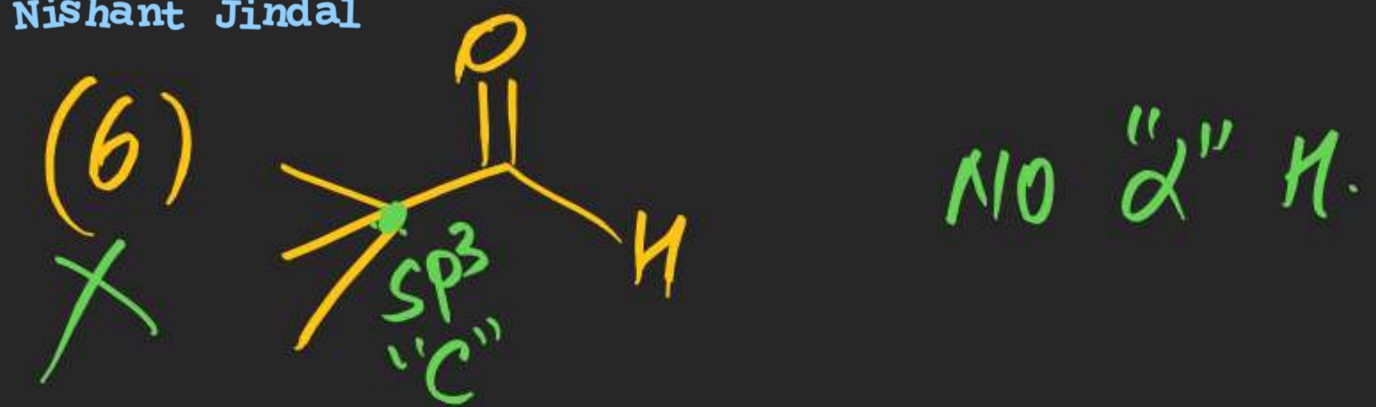
(1)

(2)

(3)

(4)

(5)   No

(6) ✗

NO "α" H.

SP³ "C"

(7)

No

(8)

SP²

No

(9)

NO

(10)

SP²

No

(11) SP² SP²

No

(12)

(13)

(14)

(15)

(16)

(17)

(18)

(19)

(20)

(21)

(22)

Ph

Ph

Ph

Ph

(23)

(24)

(25)

(26)

(27)

(28)

$$O = \bigcirc = N - OH$$
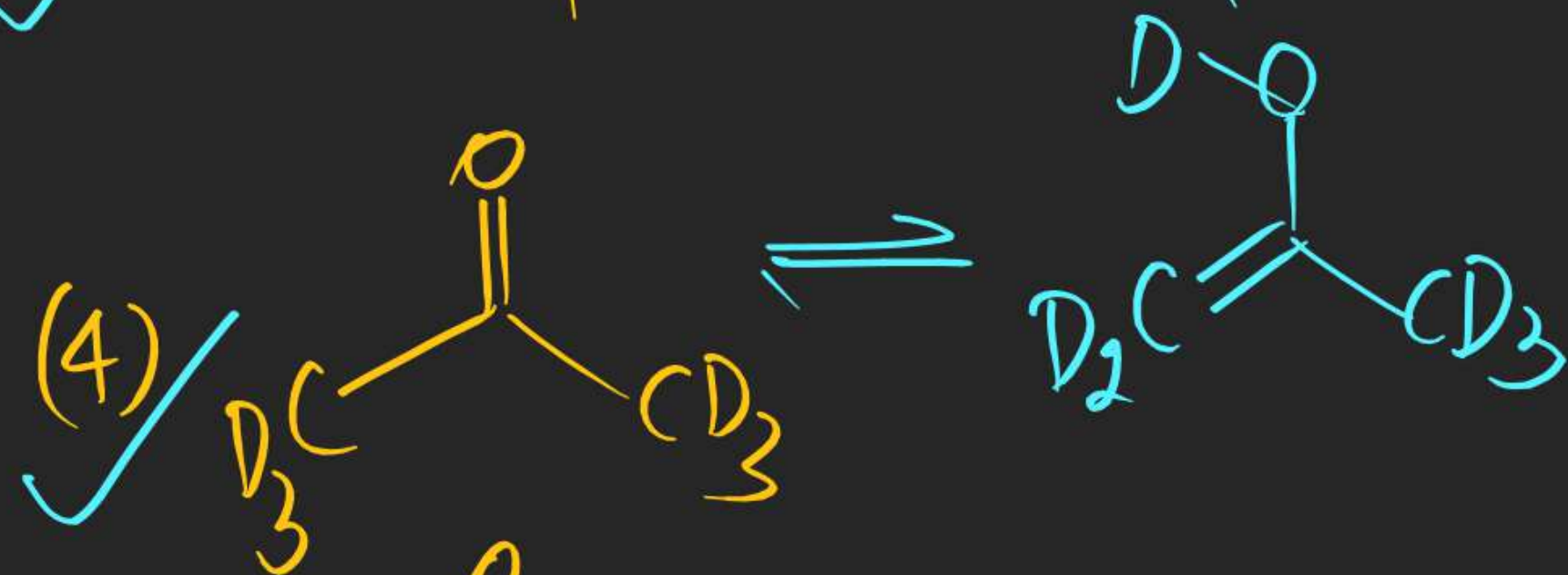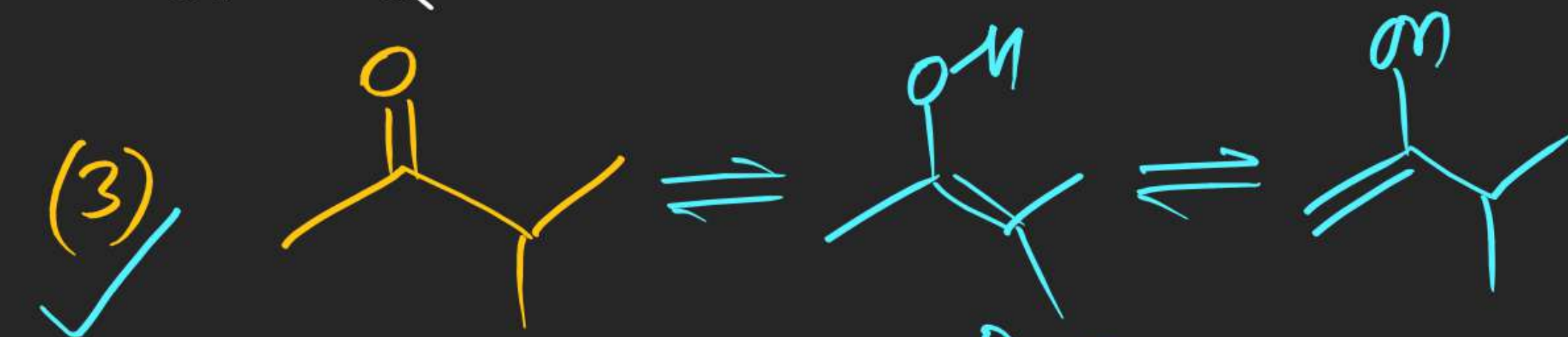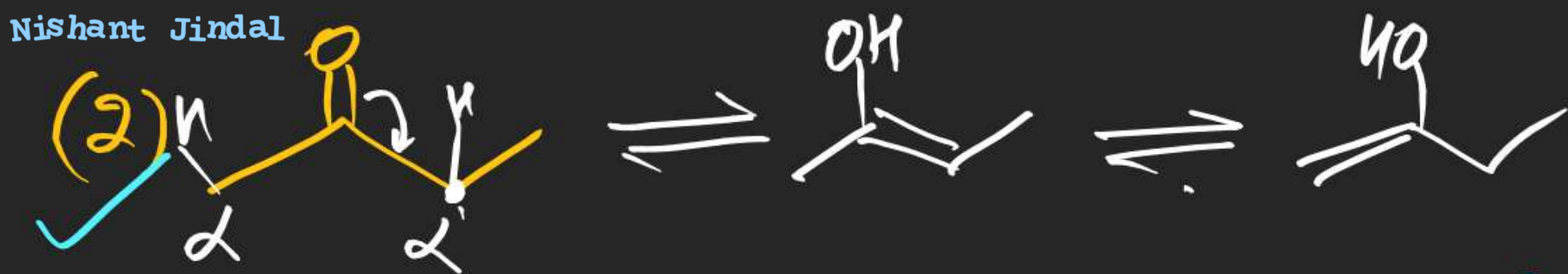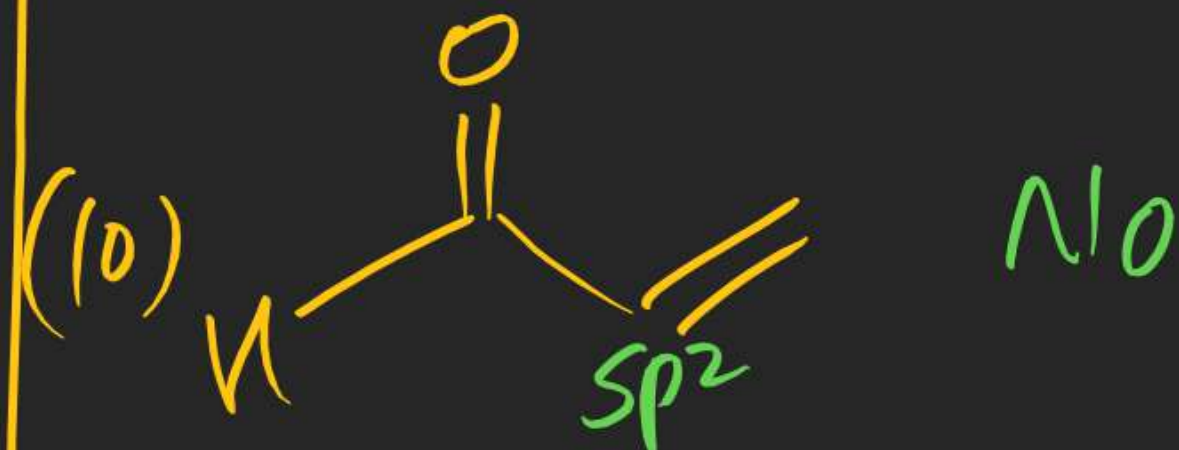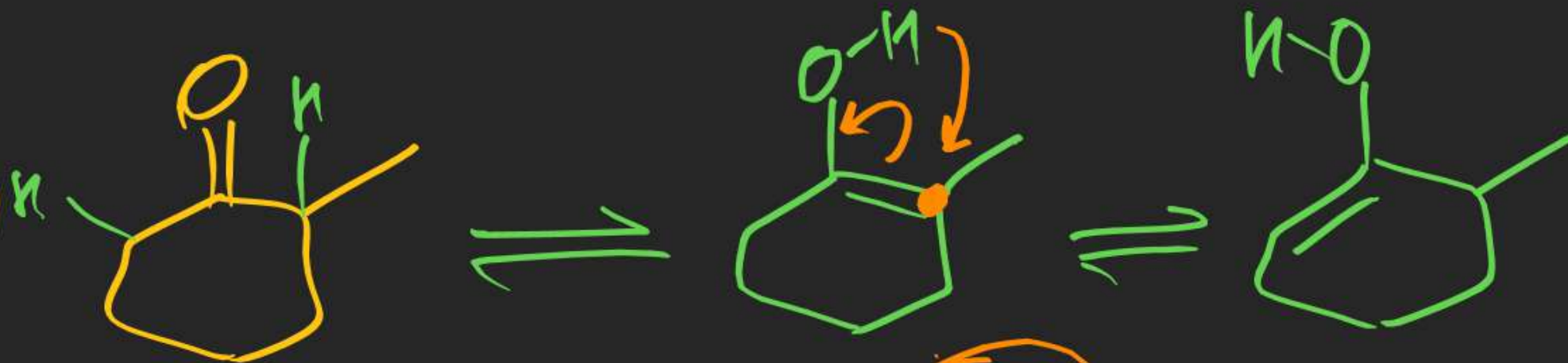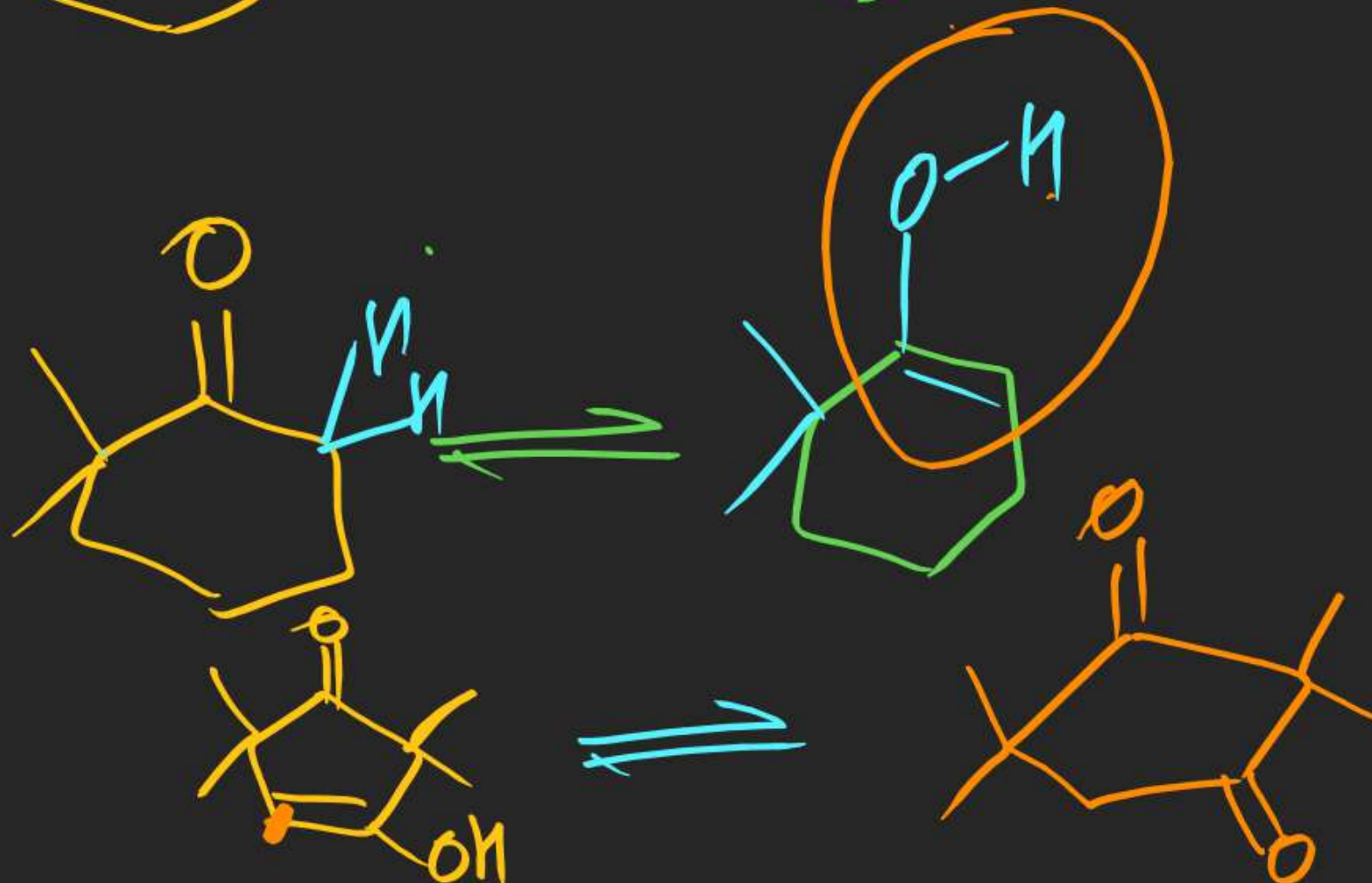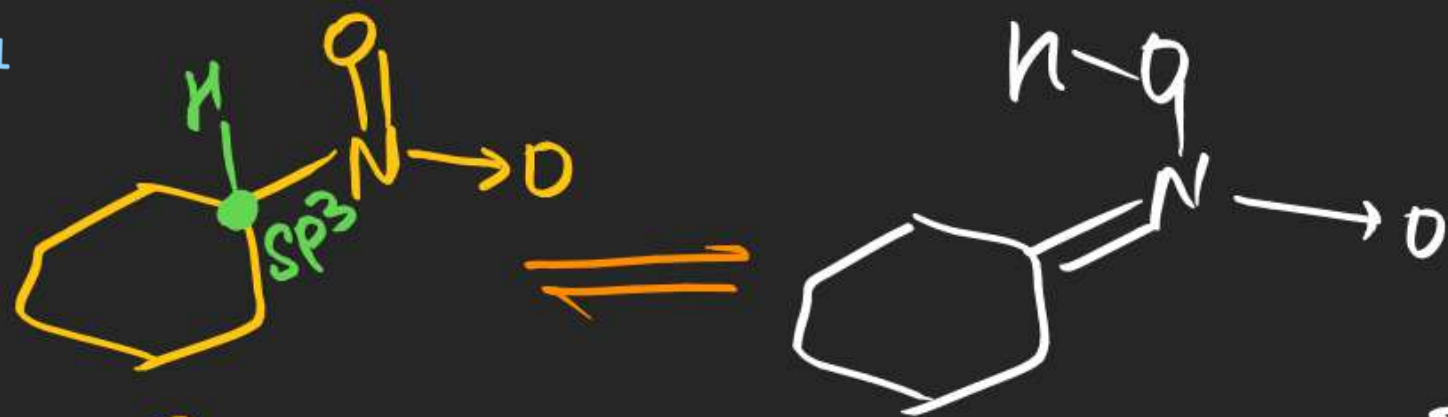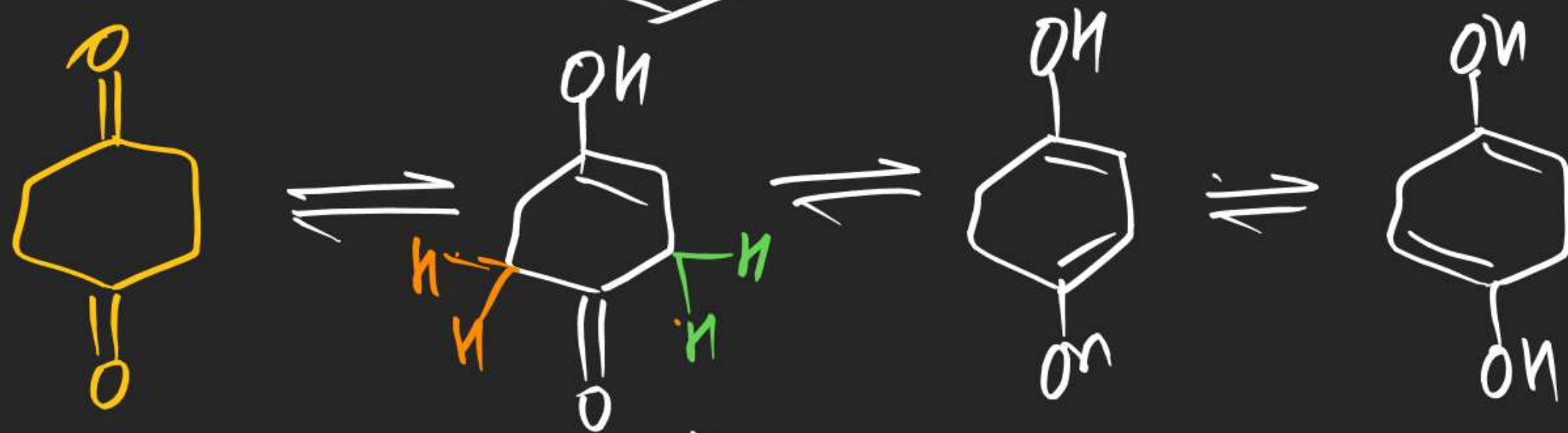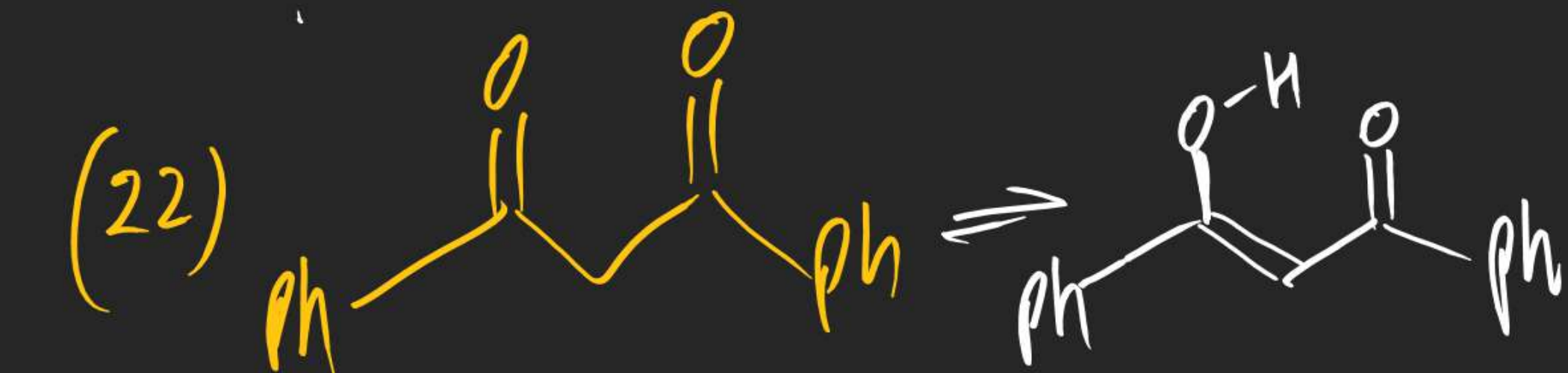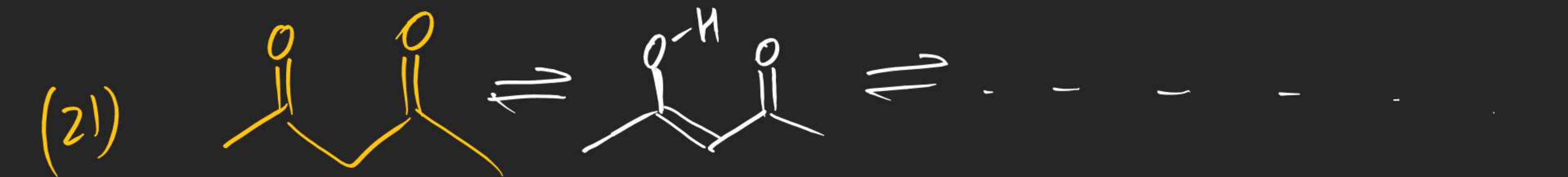
(29)

(30)

Types of Tautomerism :

There are two type of tautomerism.

(1) Aninotropy Tautomerism : when oscillating atom is anion

Tautomerism is known as Aninotropy tautomerism.

EX:

$$U^{\delta-} \longrightarrow O^{\delta-}$$

$$C^{\delta+}$$

(Not in
IIT JEE
Syllabus)

(2) **Cationotropy tautomerism:-** when oscillatiy atom is Cation, it is known as Cationotropy tautomerism.

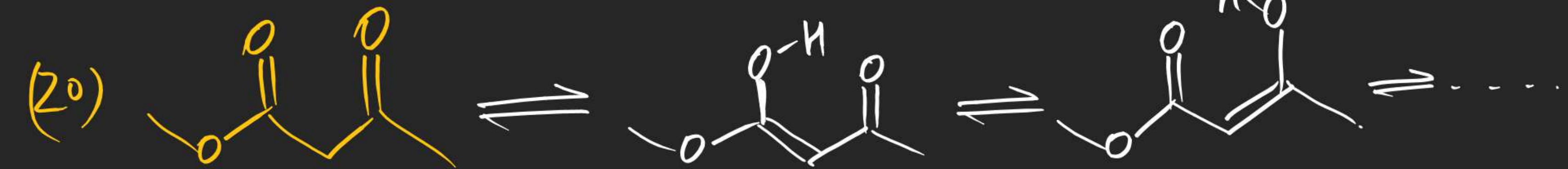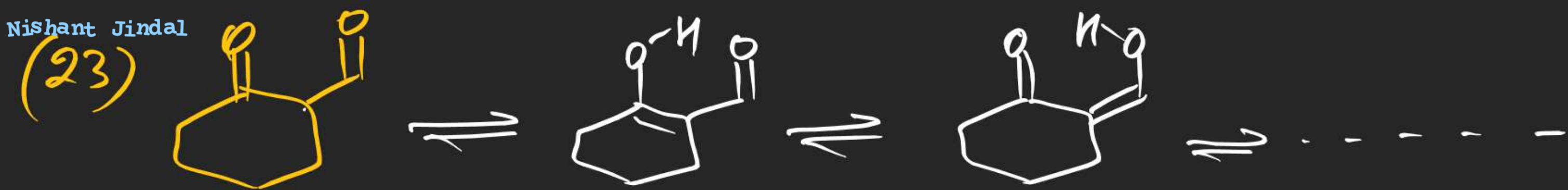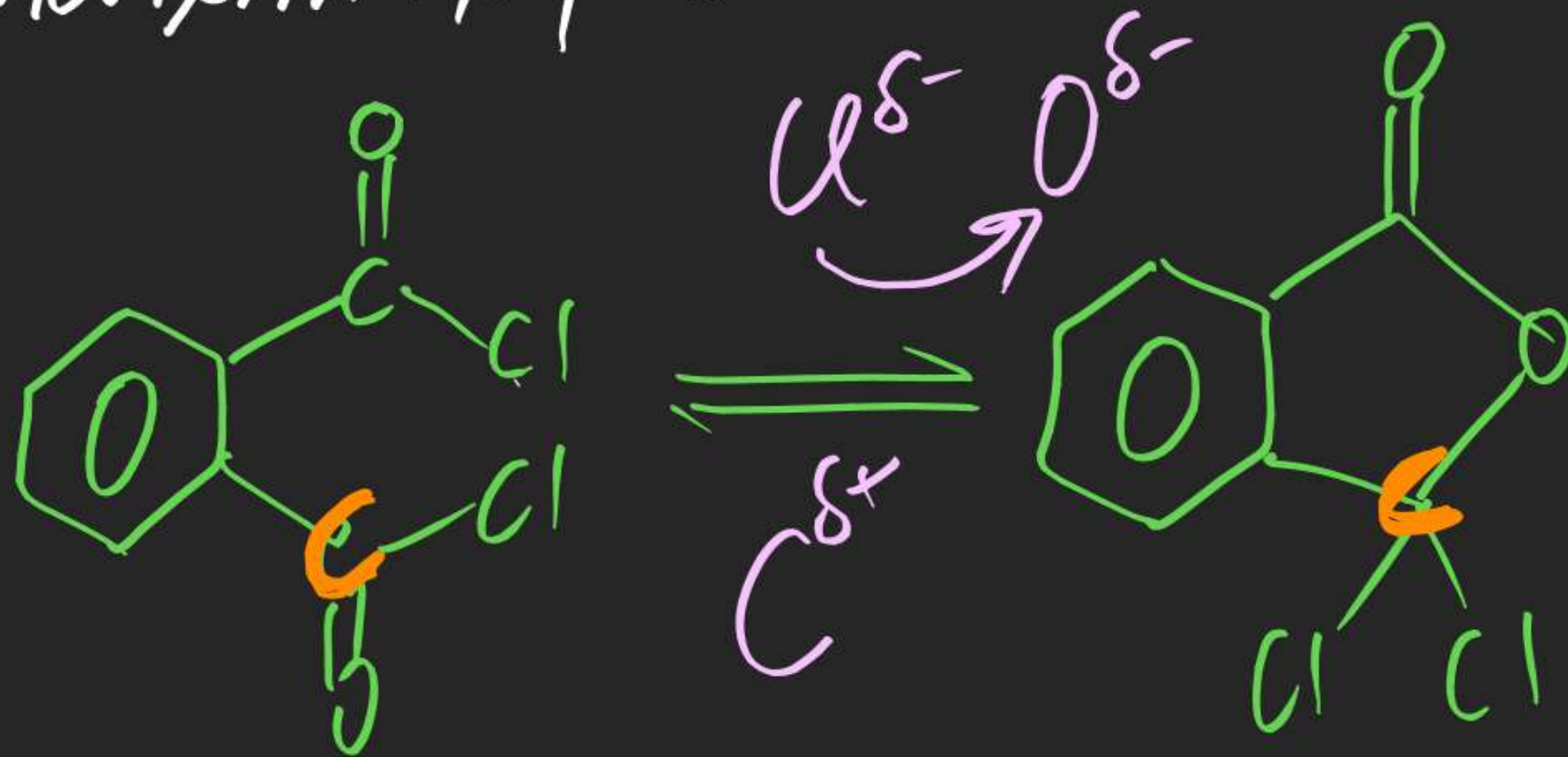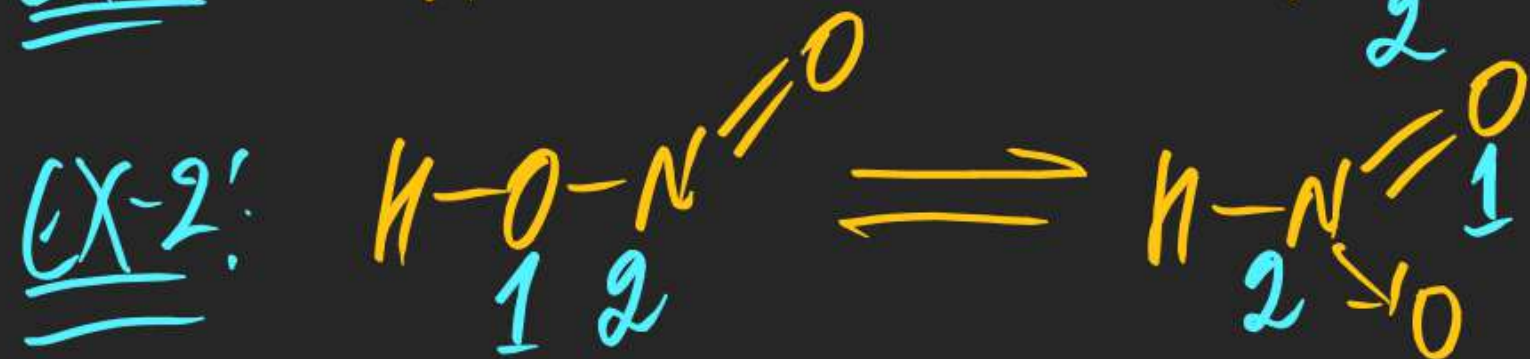There are three type of Cationotropic tautomeric system

Find

(a) **Diad System:-** when Cation oscillate b/w atom no 1 to 2 2 to 1 it is known as Diad System

$$\underline{EX-1} \qquad \overset{1}{H-C}\equiv\overset{2}{N} \ \rightleftharpoons \ H-\overset{\oplus}{\underset{2}{N}}=\overset{\ominus}{\underset{1}{C}}$$

$$\underline{EX-2}: \qquad H-\underset{1}{O}-\underset{2}{N}\!\!\overset{\displaystyle =\!\!O}{} \ \rightleftharpoons \ H-\underset{2}{N}\!\!\overset{\displaystyle =\!\!\underset{1}{O}}{\underset{\displaystyle \searrow O}{}}$$

(b) Triad System: when oscillation takes place b/w atom 1 to 3 & 3 to 1, it is known as Triad system.

EX-1: Keto to Enol Tautomerism:

Keto form $\rightleftharpoons$ Enol form
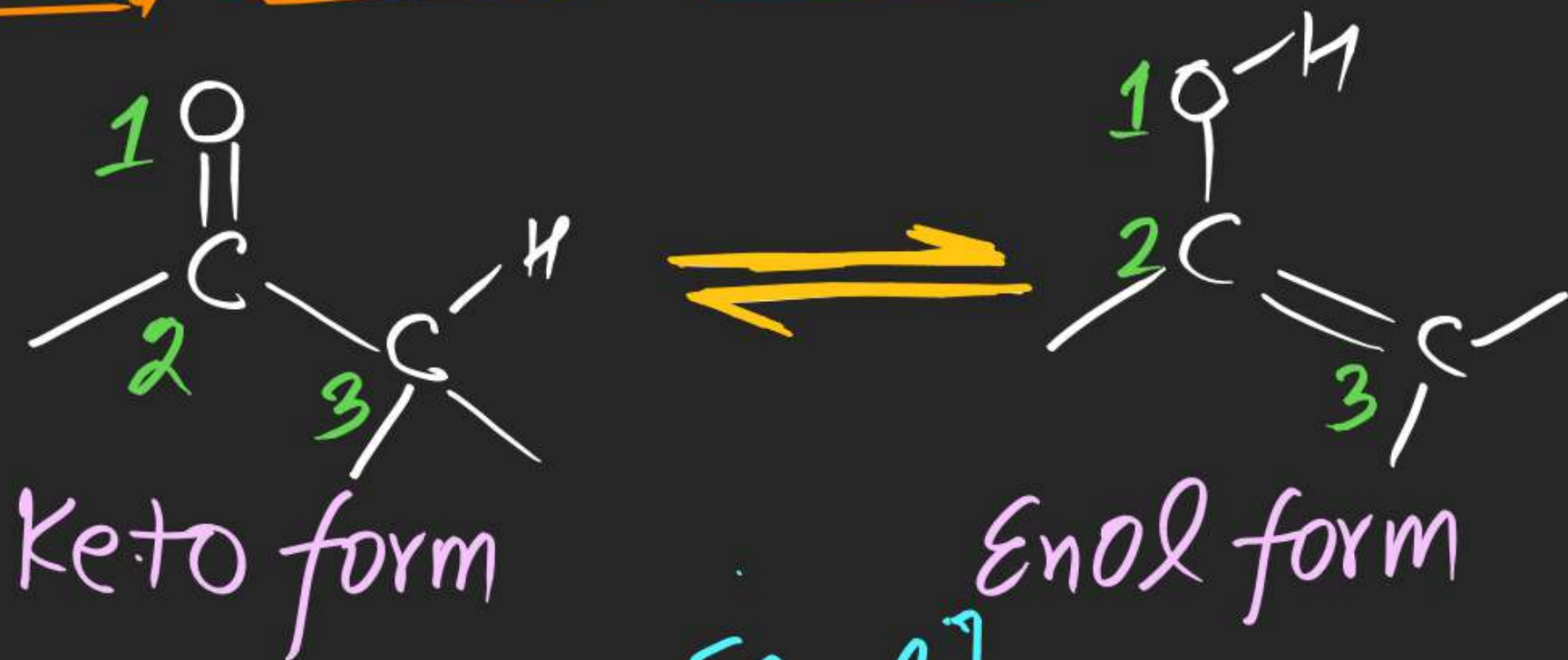
$$K_{eq} = \frac{[Enol]}{[Keto]}$$

$$BE_{(keto)} = BE_{C=O} + BE_{C-C} + BE_{C-H} \uparrow$$

$$BE_{(Enol)} = BE_{C=C} + BE_{C-O} + BE_{O-H} = \bigcirc\bigcirc$$

Since $BE_{keto} > BE_{Enol}$

Hence $[keto] > [Enol]$
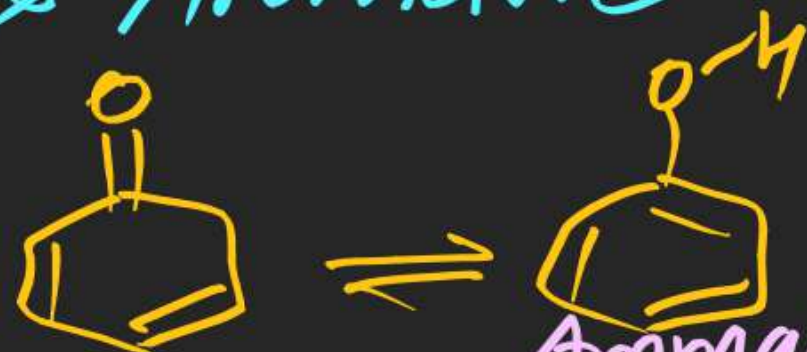
$$\Rightarrow \quad 1 > \frac{[Enol]}{[keto]}$$

$$\Rightarrow \quad \boxed{1 > K_{eq}}$$

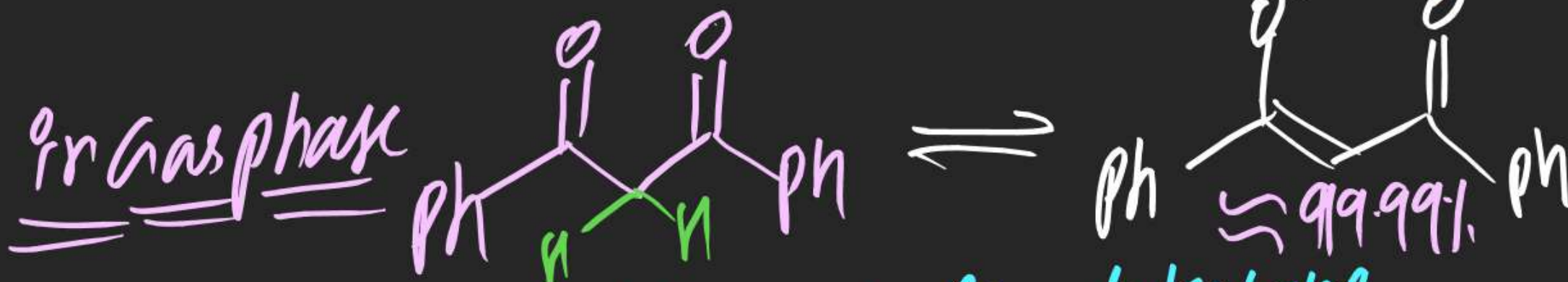<u>Note</u>: % keto dominates over % Enol at normal con^n.
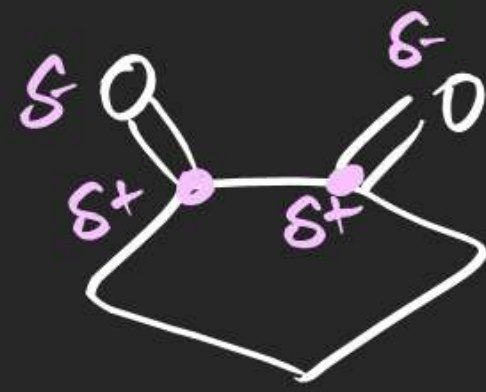
M.Imp

$\% [Enol] > \% [keto]$

iff (i) Enol is Aromatic

$[Enol] > [keto]$

Aromatic

(ii) keto is 1,3-diCarbonyl Compound $\left(\underline{\text{Aldehyde \&}} \atop \underline{\text{ketone Only}}\right)$
with Active "H" atom.

In Gasphase

$\simeq 99.99\%$

$[Enol] >> [keto]$.

(iii) keto is 1,2 Cyclic diketone.

$[Enol] > [keto]$

(99.99%)

EX-2! Imine - Enamine Tautomerism :-

Imine
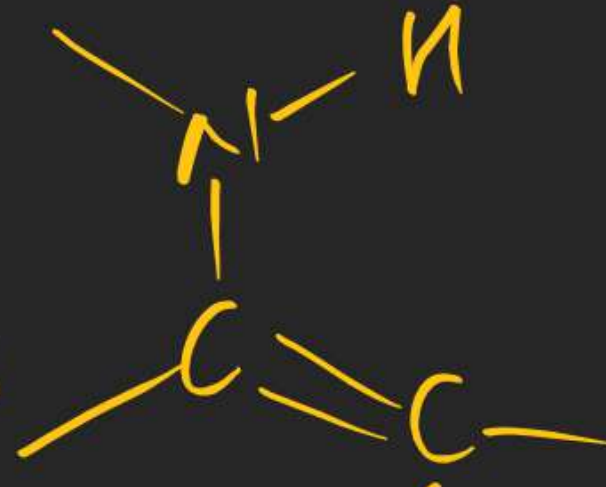
Enamine

$Keq < 1$

EX-3: **Nitro-Acinitro Tautomerism:**

$$\boxed{K_{eq} < 1}$$
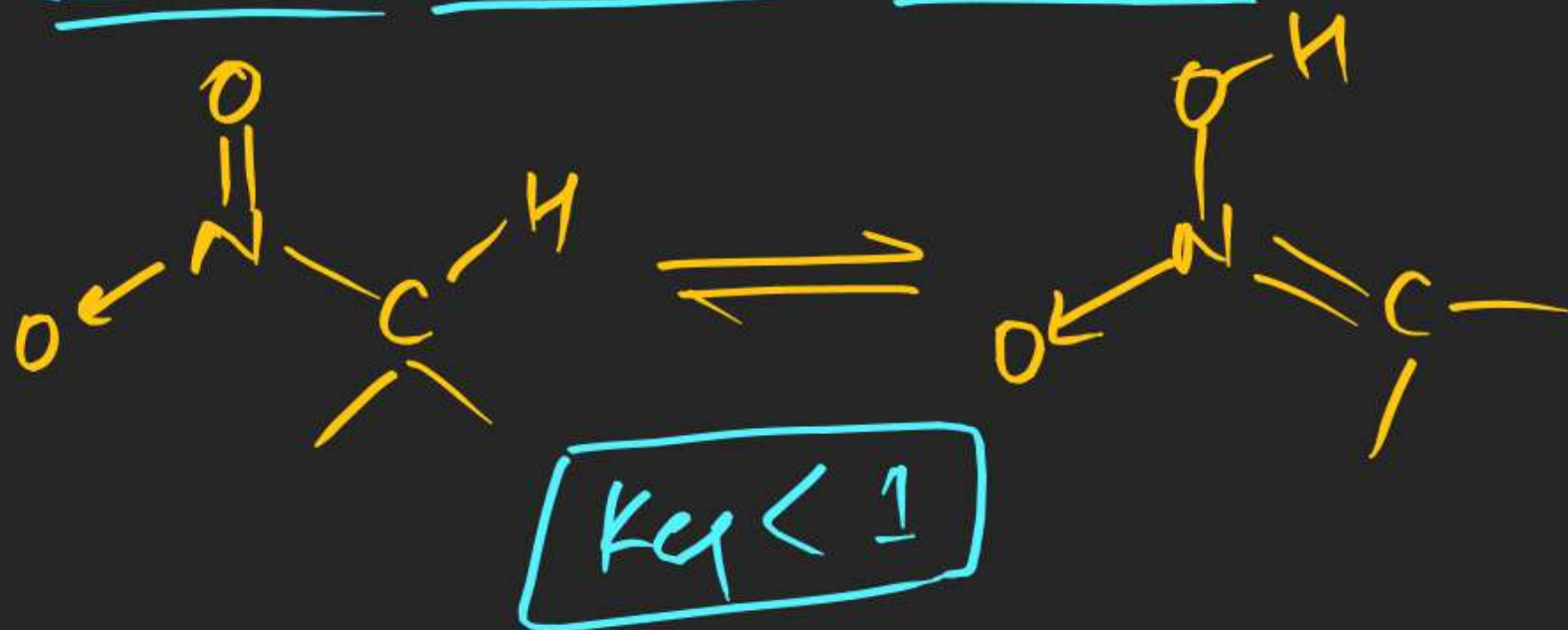
EX-4: **Nitroso-Oxime Tautomerism:**

$$\boxed{K_{eq} > 1}$$

(3) Space Tautomerism:-