CH 8 Kinetics

Friday, 30 January 2026 5:33 PM

Rate of Reaction (Kinetics)

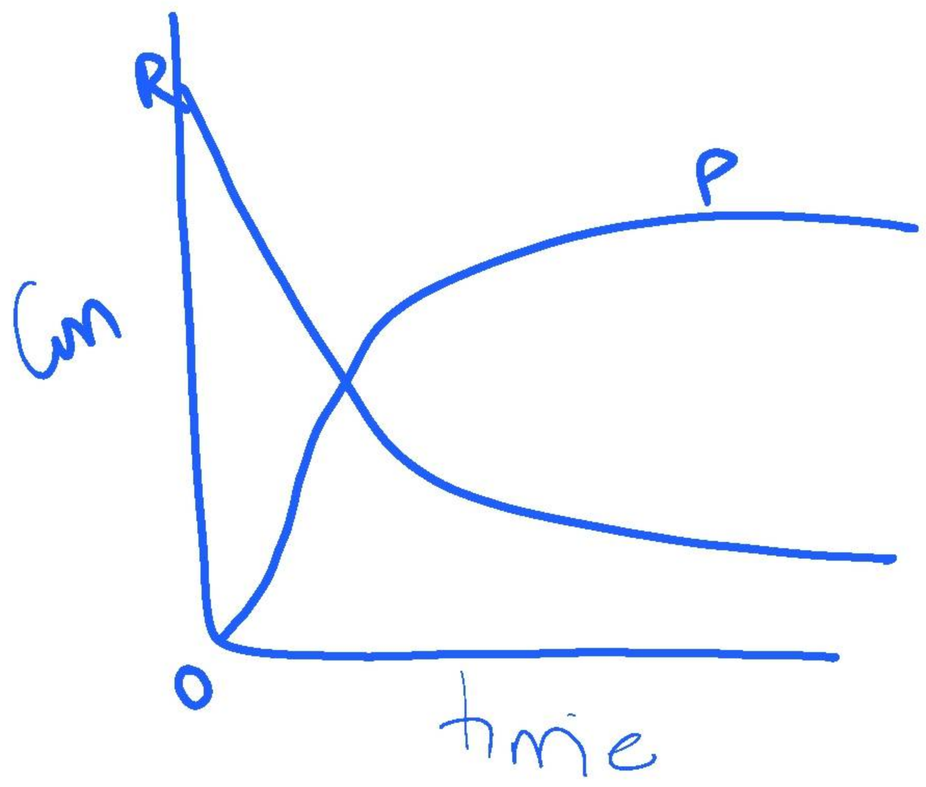
Speed

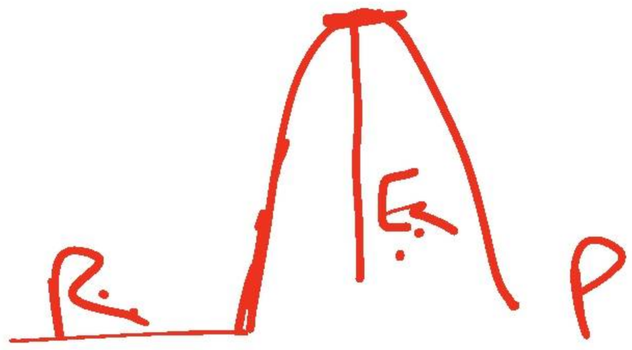
Apparatus Stopwatch

Rate of Reaction = Change in Conc of R/P / time

$A + B \longrightarrow C$

Unit = mol / dm^3 / sec $mol \cdot dm^{-3} \cdot S^{-1}$



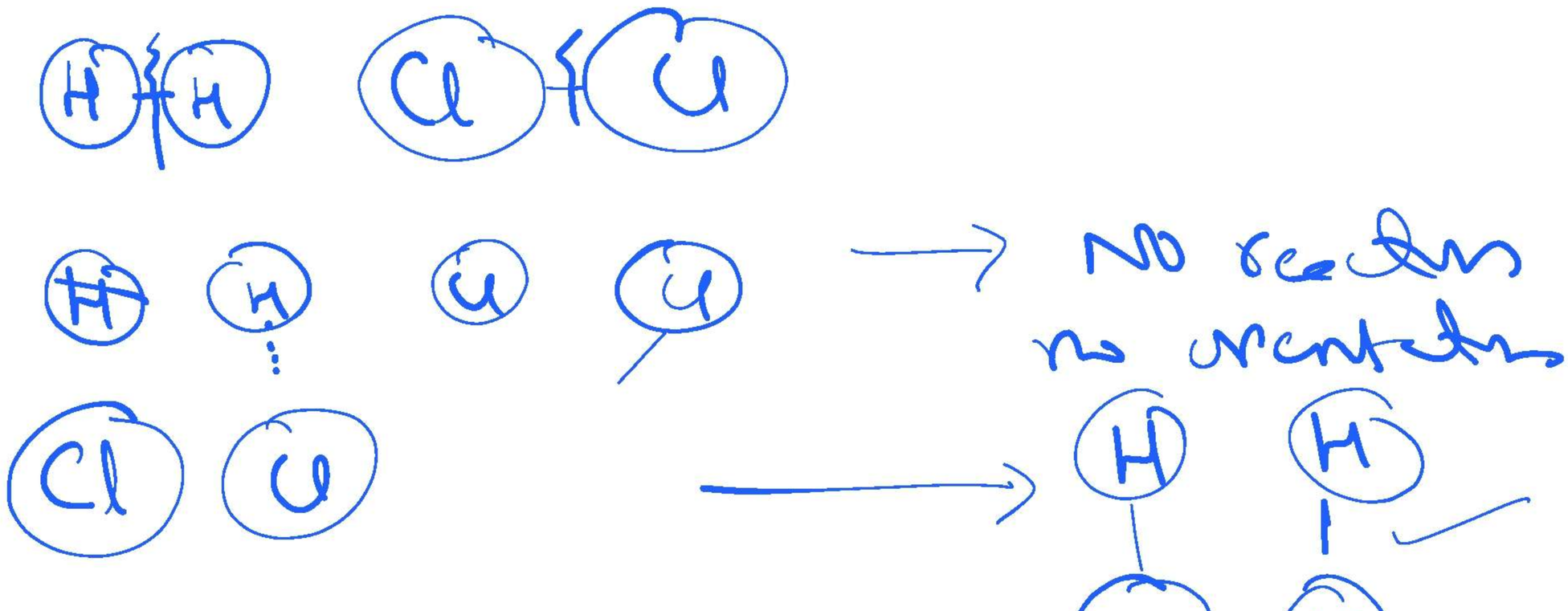


Collision theory.

(1) R must collide to give Product

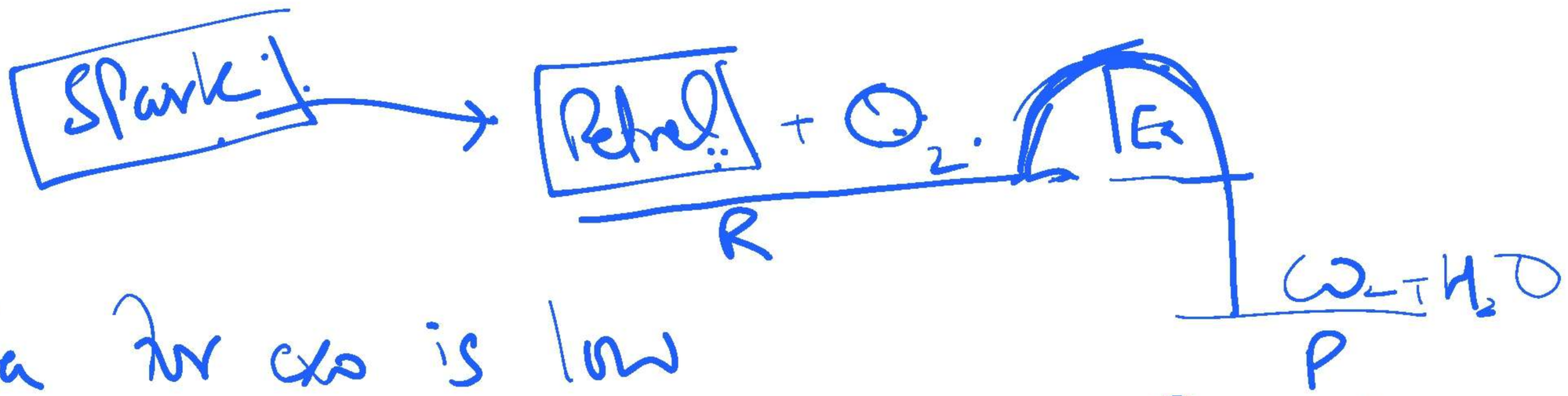
(2) Energy of Reactant $\geq$ Ea (Activation energy)

(3) Molecules must collide with proper orientation.



Successful collision / effective collision / fruitful collision

Ea Minimum energy which is required to start a chemical reaction

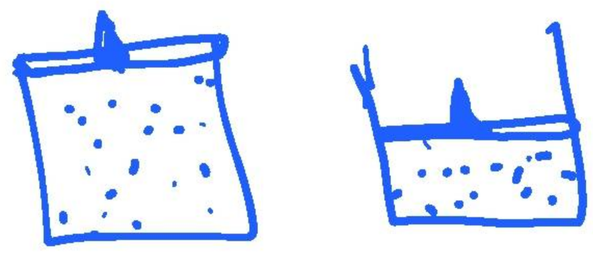


Ea for exo is low
Ea → for endo is high & it need continuous heating

Factors Affecting Rate of Reaction

① Concentration ∝ number of molecules per dm^3 ∝ effective collisions ∝ rate of reaction

② Pressure (only for gases)

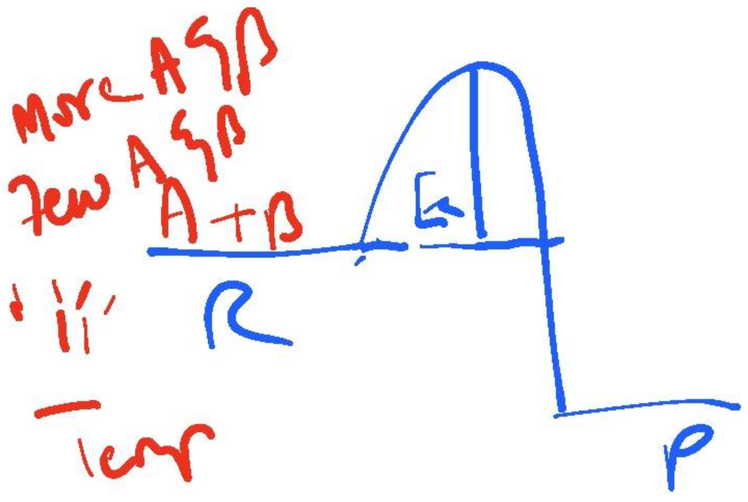


Increase P ∝ Distance b/w molecules ↓ decreases ∝ Number of collisions ∝ rate of reaction

③ Temperature.

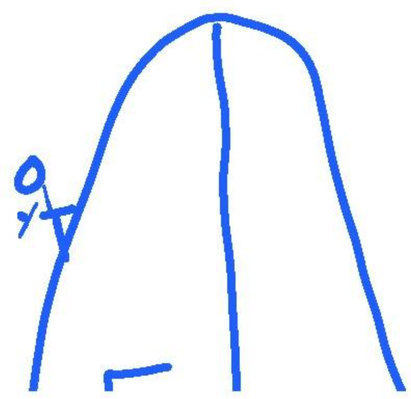
(a) Increase temp ∝ K.E ∝ effective collisions

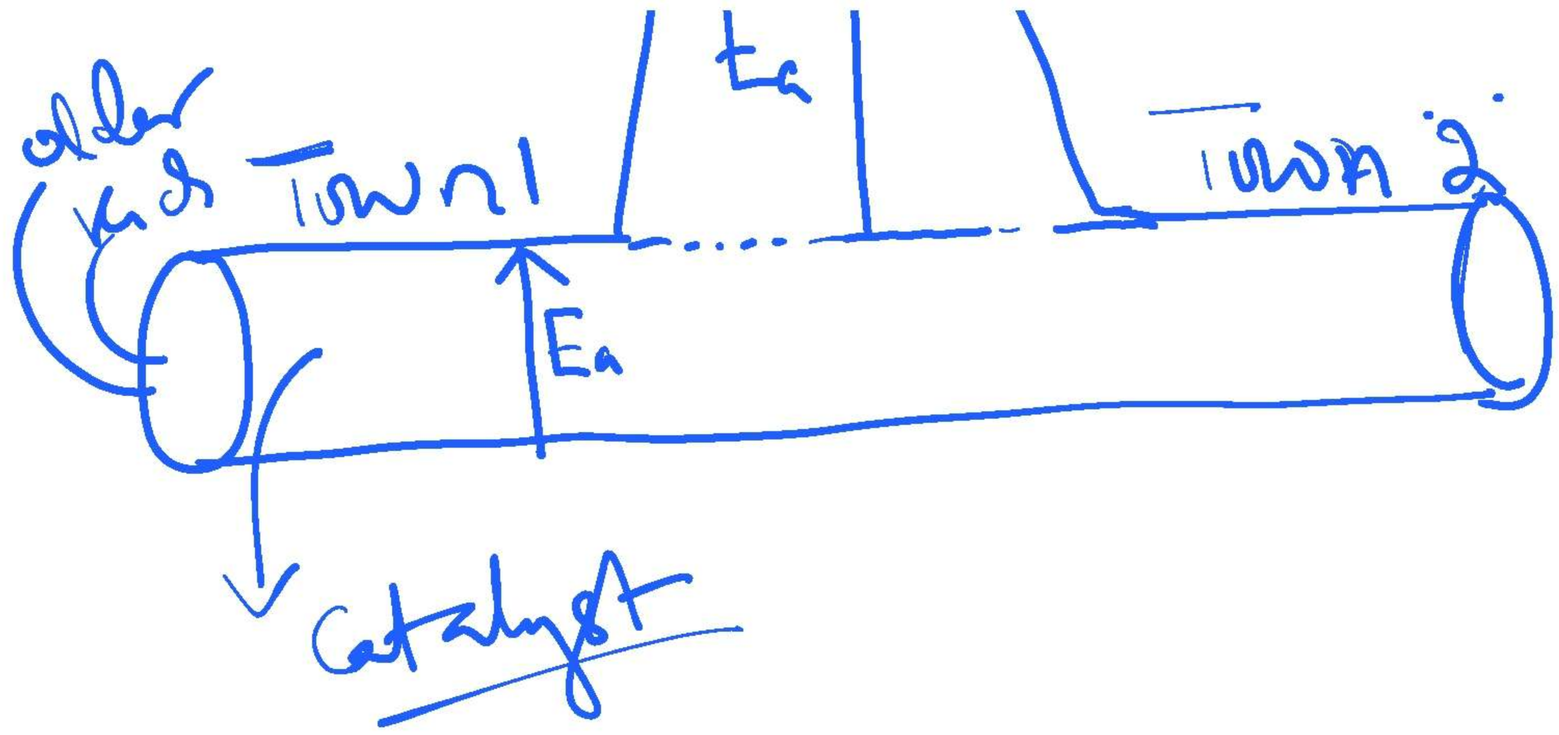
(b) More particles will have energy greater than Activation energy.



④ Catalyst

Increase the rate of reaction by providing an alternative path having lower Ea.





(5) Surface Area (for solids)

Surface area $\propto$ more number of collisions with reactant $\propto$ effective collisions $\propto$ rate of reaction

(3)

Rate very slow

$CaCO_3$

(2)

$CaCO_3$

(1)

More surface area

Powder $CaCO_3$

Very faster reaction

Most imp

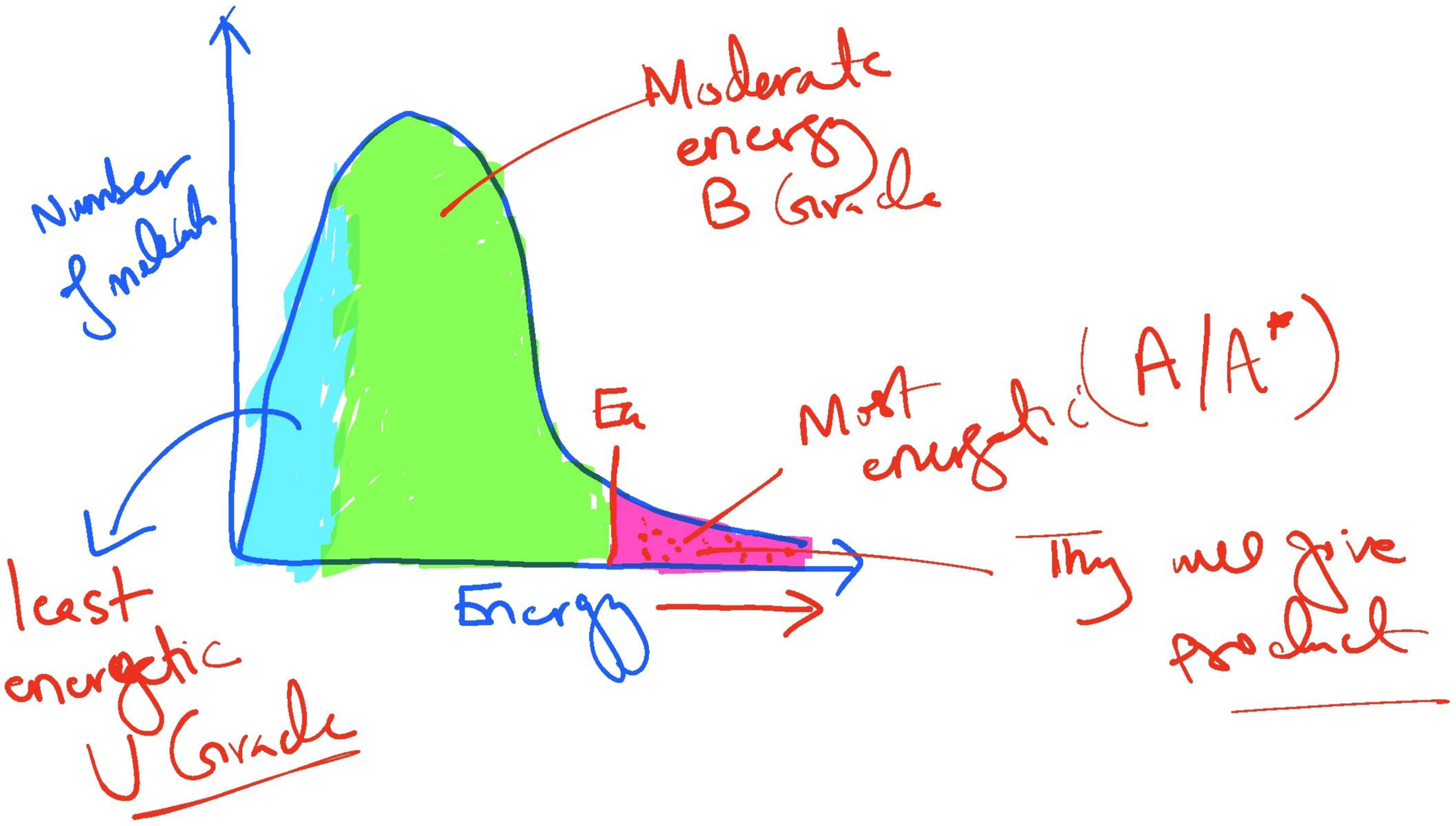
Maxwell & Boltzman Distribution of Energy Curve

Factors affecting

(a) Catalyst

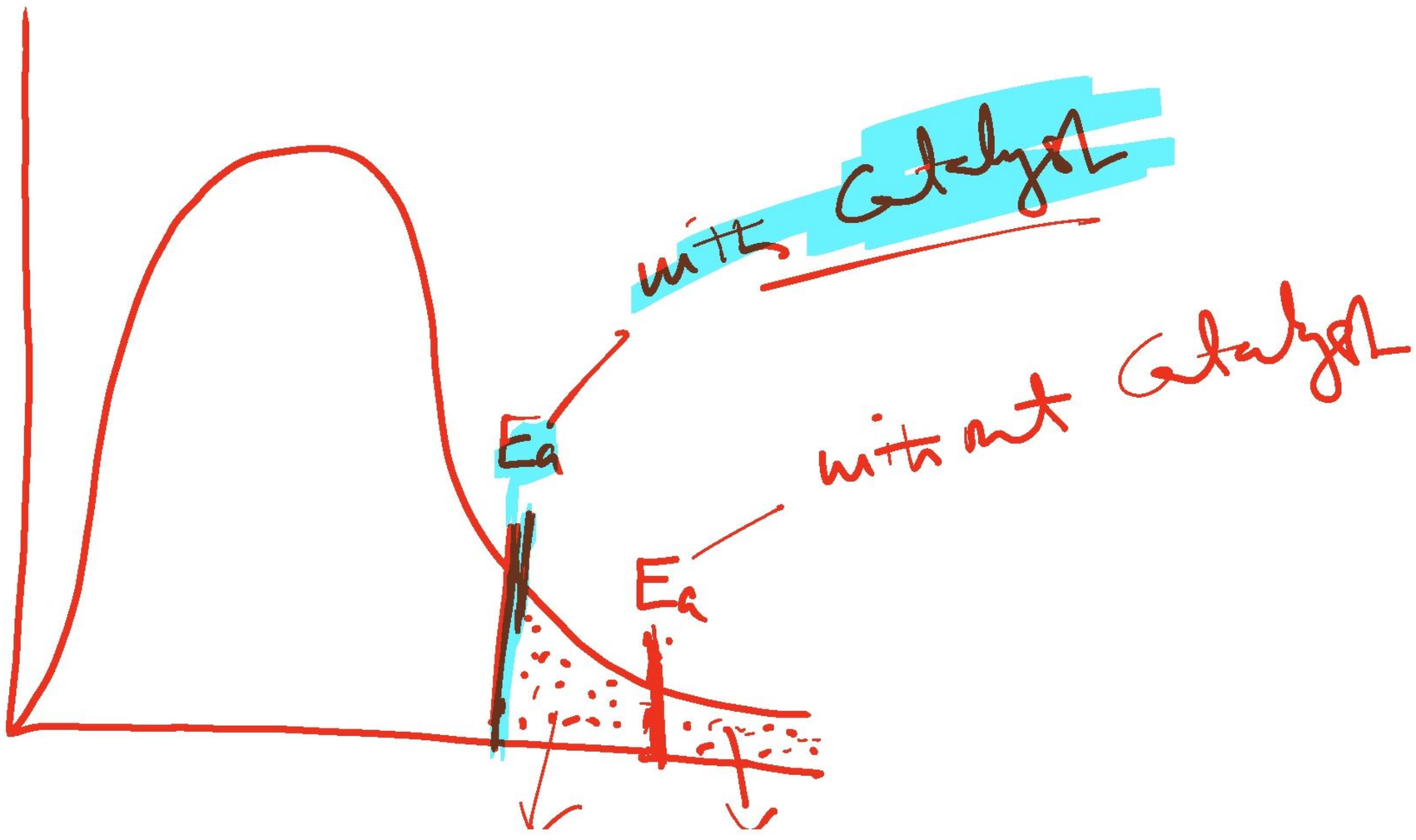
(b) Temperature

applicable for gases only.



Catalyst

Adding the catalyst doesn't change the Curve shape

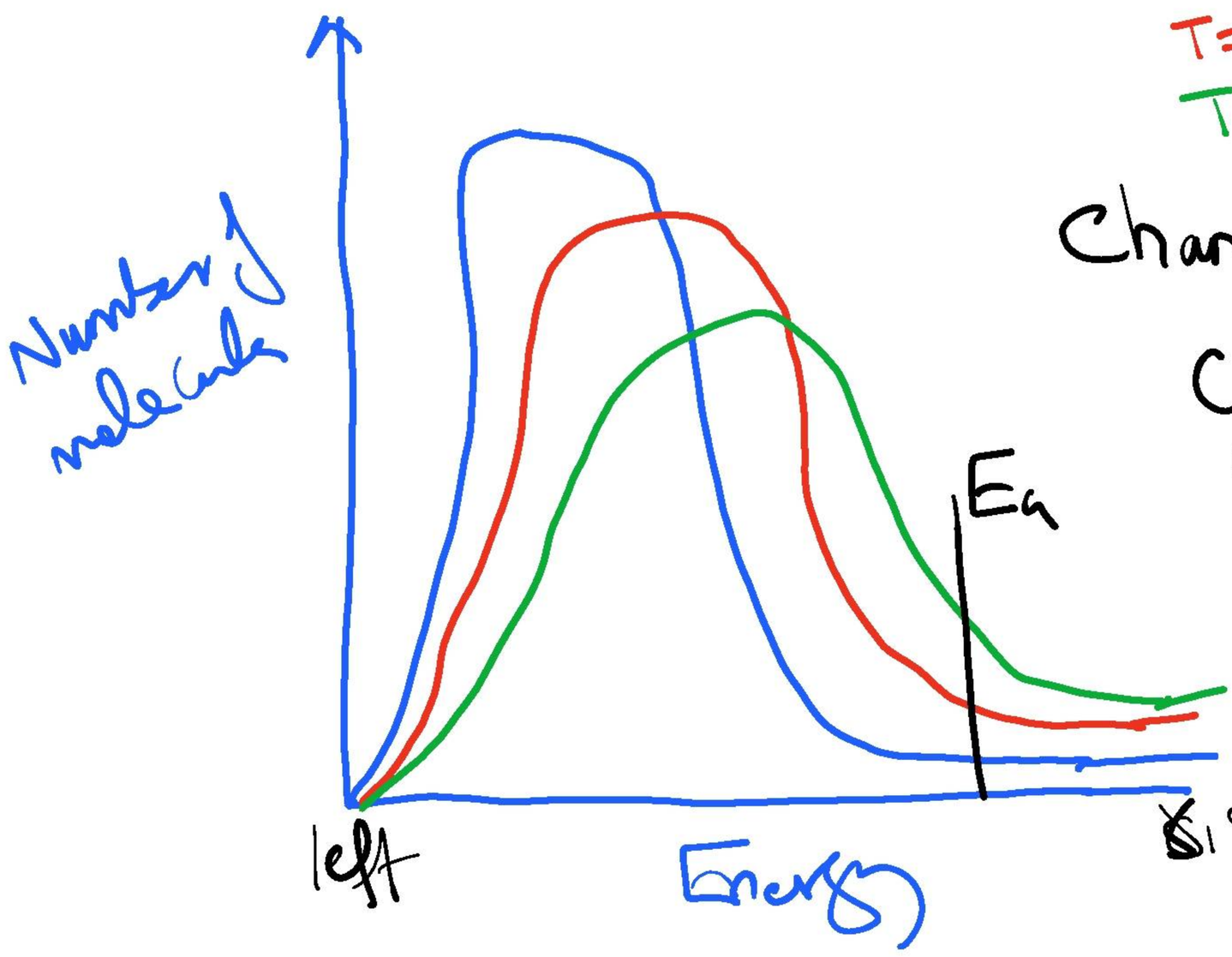


100 min molecule with added

100 molecule

200 molecule

Effect of temperature



T = 15°C
T = 25°C
T = 35°C

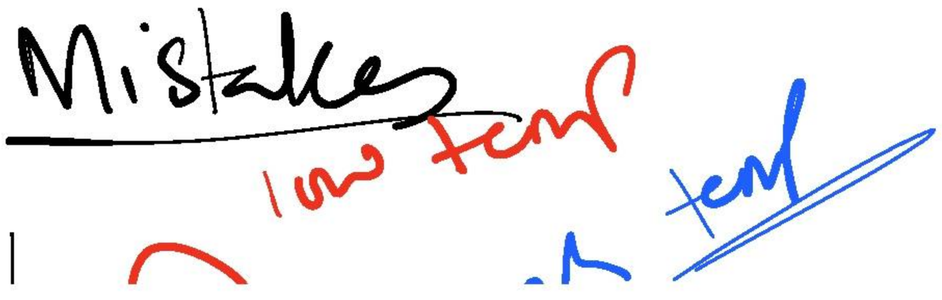
Change in shape of curve but Ea remains same at all temperature.

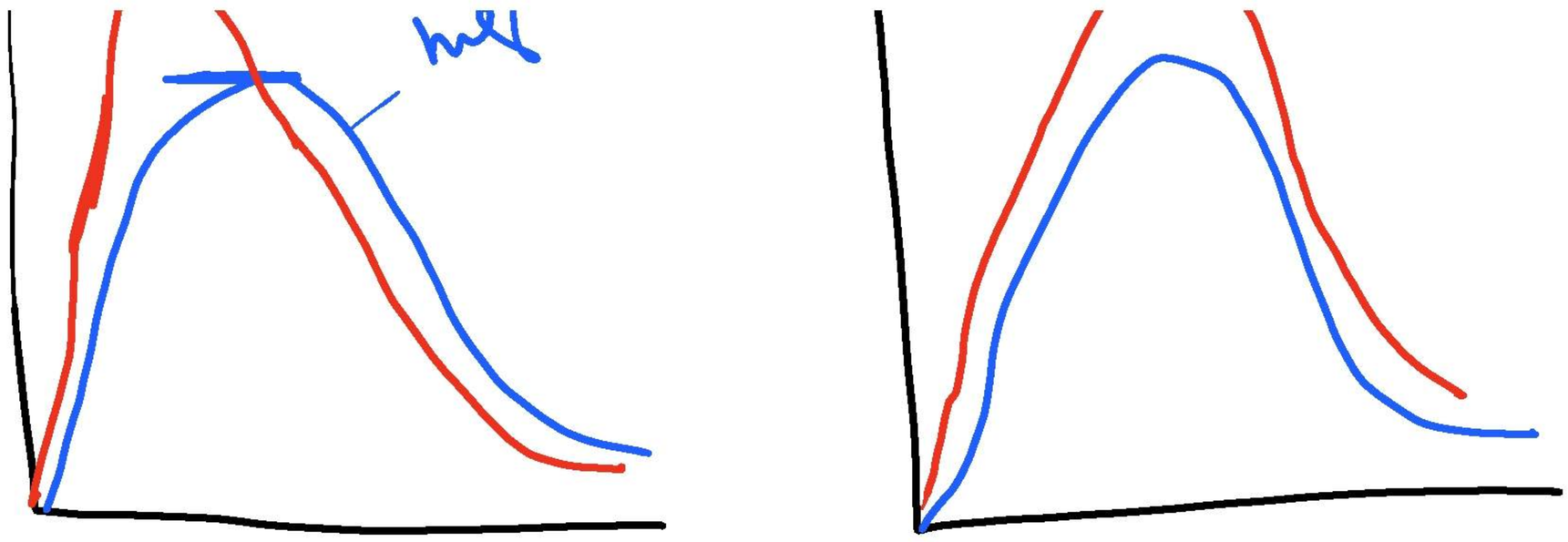
lower temperature → right will be more and curve will be shifted to left.

Higher temperature →

with Catalyst
without Catalyst

Mistakes





Catalysis

Homogenous

R + Catalyst are in same state (phase)

Solution form

(1) $CH_3COOH_{(aq)} + C_2H_5OH_{(aq)} \xrightleftharpoons{H^+_{(aq)}} CH_3COOC_2H_5 + H_2O_{(aq)}$

Gas phase

$2SO_{2(g)} + O_{2(g)} \xrightarrow{NO_{(s)}} 2SO_3$

Atmosphere

Acid rain reaction

Heterogenous

R + Catalyst are in different state (phase)

$N_{2(g)} + 3H_{2(g)} \xrightleftharpoons{Fe_{(s)}} 2NH_3$

$2SO_2 + O_2 \xrightleftharpoons{V_2O_5} 2SO_3$

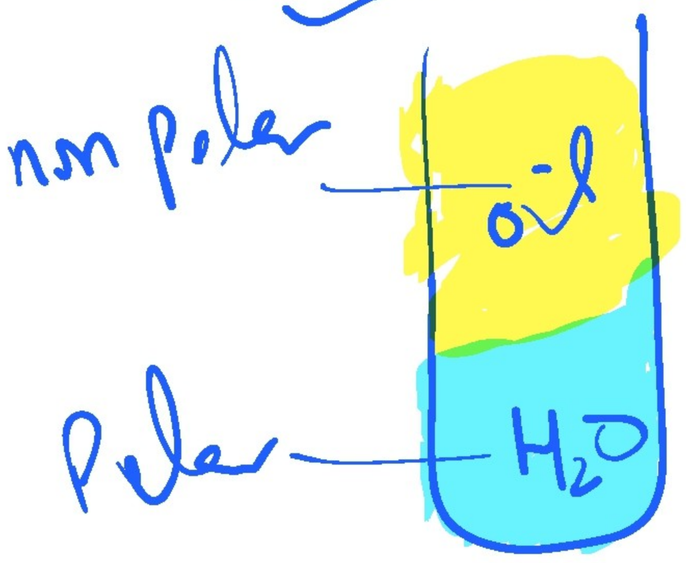
$H_2O_{2(l)} \xrightarrow{MnO_{2(s)}} H_2O_{(l)} + \frac{1}{2}O_2$

O_3 $\xrightarrow{\quad}$ $3O_2$

(g) (g)

Depletion of ozone

Oil + H_2O



state is liquid

2 phases

It is not homogenous