Pakistan School
Kingdom of Bahrain


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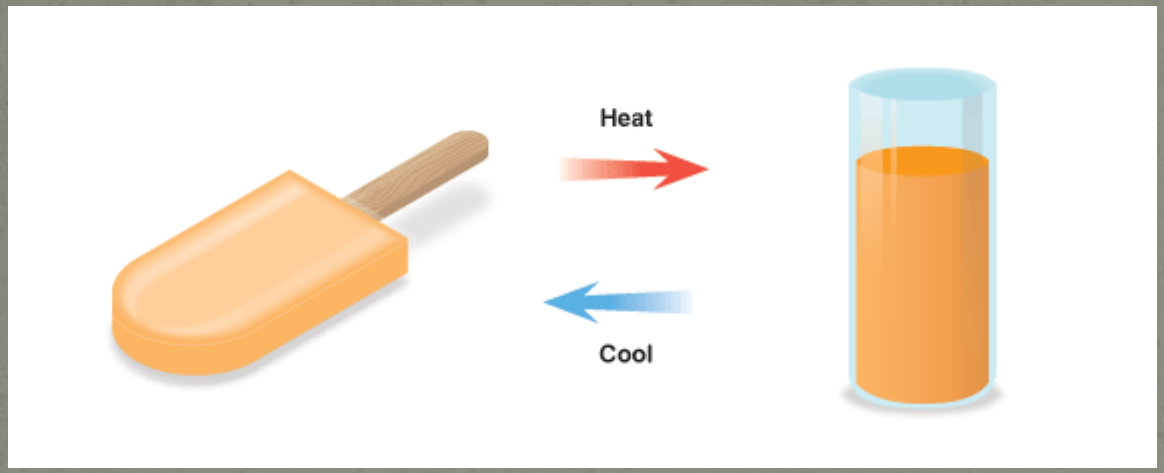
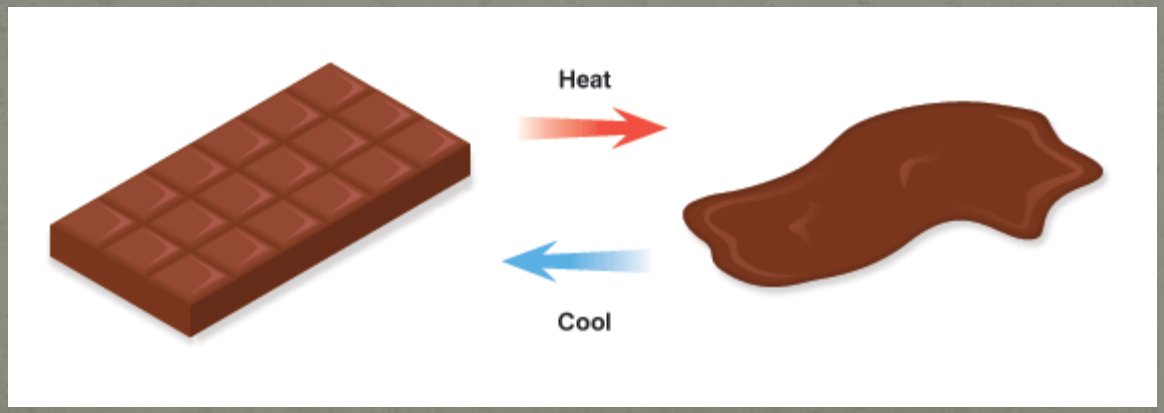
PAKISTAN SCHOOL
المدرسة الباكستانية

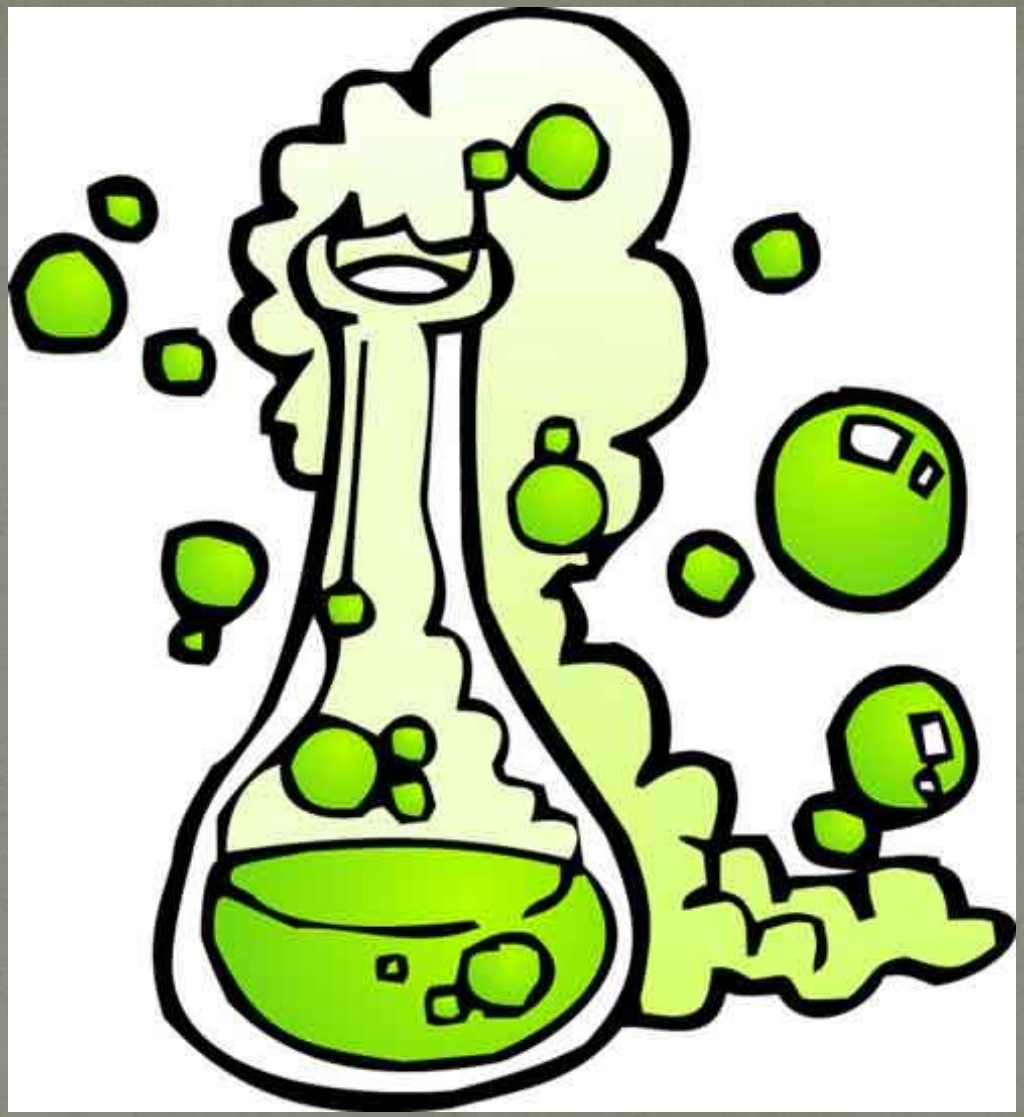
Class 10th

Subject Chemistry

Engaging Starter







TOPIC:

Reversible Reactions And Dynamic Equilibrium

Objectives

At The End Of This Lesson, Students Will Be Able To:

- Define Chemical Equilibrium In Term Of A Reversible Reaction.
- Write Both The Forward And The Reverse Reactions.

Complete reaction:

A complete reaction is one in which all reactants have been converted to products.

Example:

$HCl + NaOH \longrightarrow NaCl + H_2O$

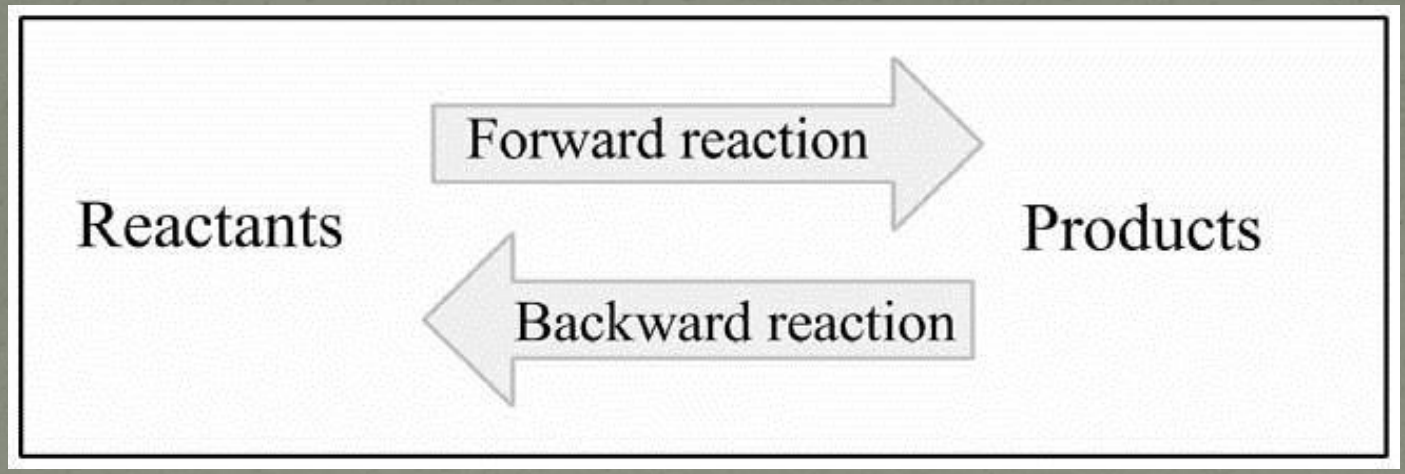
Reversible Reactions:

- A reaction in which the products can react together to re-form the original reactants is called reversible reaction

OR

- A reaction which may proceeds in the forward direction as well as in the reverse direction under the same conditions is called the reversible reaction.

Examples:



$$2SO_{2(g)} + O_2(g) \rightleftharpoons 2SO_{3(g)}$$

$$N_{2(g)} + O_{2(g)} \rightleftharpoons 2NO_{(g)}$$

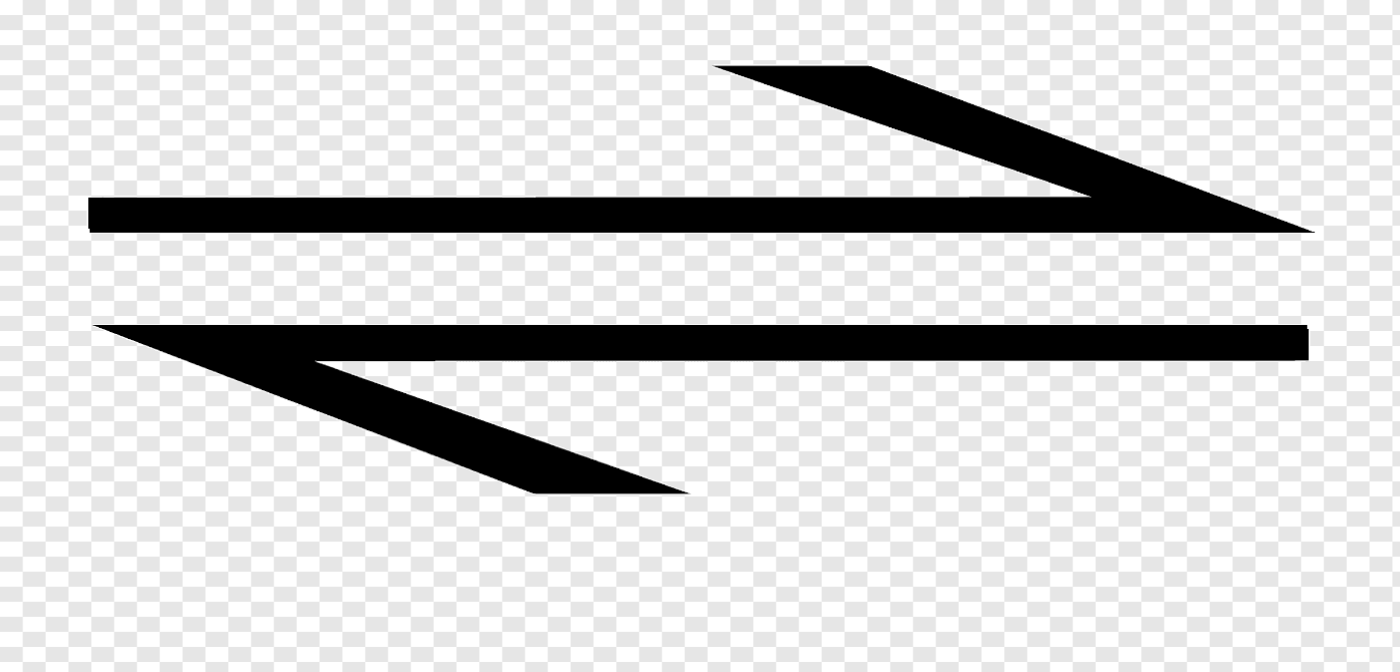
Properties of reversible reactions:

- Reversible reactions never go to completion.
- All reversible changes (physical and chemical)

Occure simultaneously in both the directions.

- **Notation of reversible reaction:**

The double arrow in the chemical equation shows that the reaction is reversible.



Equilibrium Mixture:

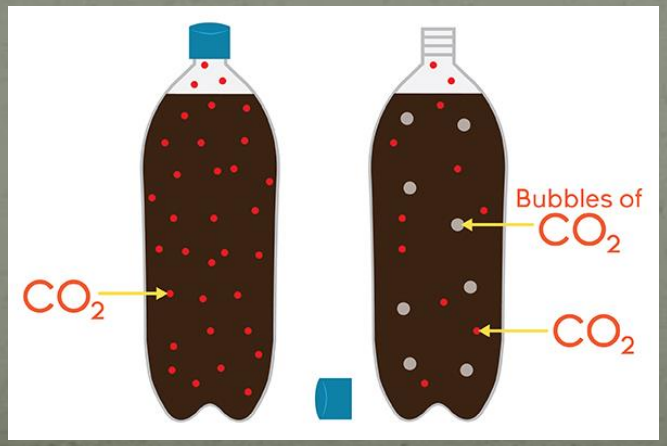
The concentrations of reactants and products are called equilibrium concentrations and the mixture is called equilibrium mixture.

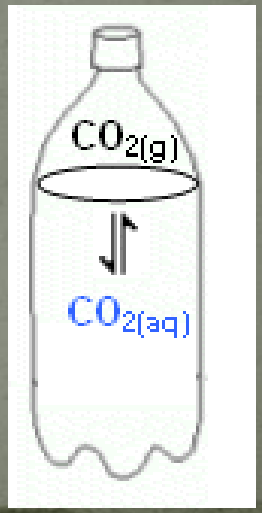
- When fizzy drinks are made, CO_2 is dissolved in the liquid drink under pressure and sealed. When you remove lid of the bottle, bubbles of CO_2 suddenly appear .When you put the lid back on the bottle, the bubbles stop.

This is due to the following equilibrium.

$$CO_{2(aq)} \rightleftharpoons CO_{2(g)}$$

- The forward reaction happens during manufacturing and the reverse reaction happens on opening.

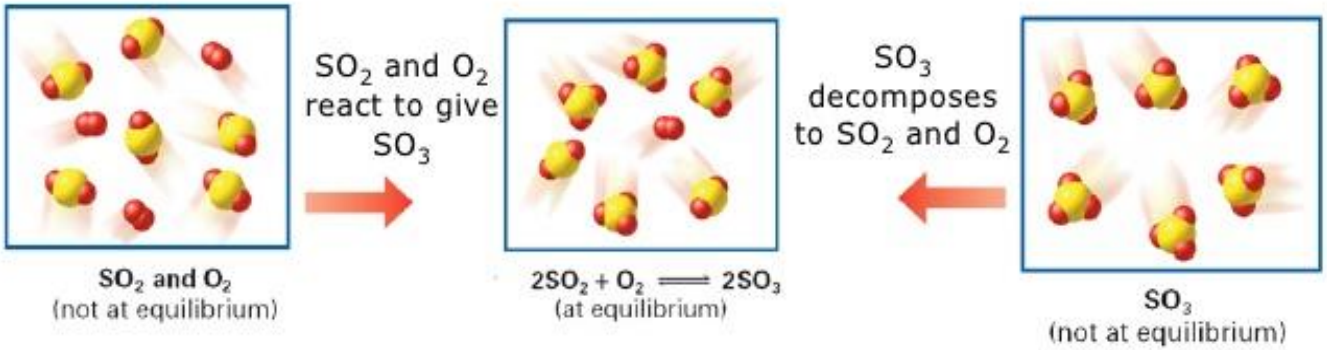




Differentiate between forward and reverse reactions:

Forward Reactions	Reverse reactions
i) It is written from left to right.	) It is written from right to left.
ii) Reactants produce products.	ii) Products produce reactants.
iii) Rate is fastest in the beginning and gradually slows down.	iii) Its rate is zero in the beginning and gradually speeds up.
Example	Example
$2NO_2 \longrightarrow N_2O_4$	$N_2O_4 \longrightarrow 2NO_2$

$$2SO_2 + O_2 \rightleftharpoons 2SO_3$$



At equilibrium,
all three types of molecules are present.

Molecules of SO_2 and O_2 react to give SO_3. Molecules of SO_3 decompose to give SO_2 and O_2 .

<u>Forward Reaction:</u>

In the first reaction (from left to right) SO_2 and O_2 produce SO_3 .

$$2SO_2 + O_2 \longrightarrow 2SO_3$$

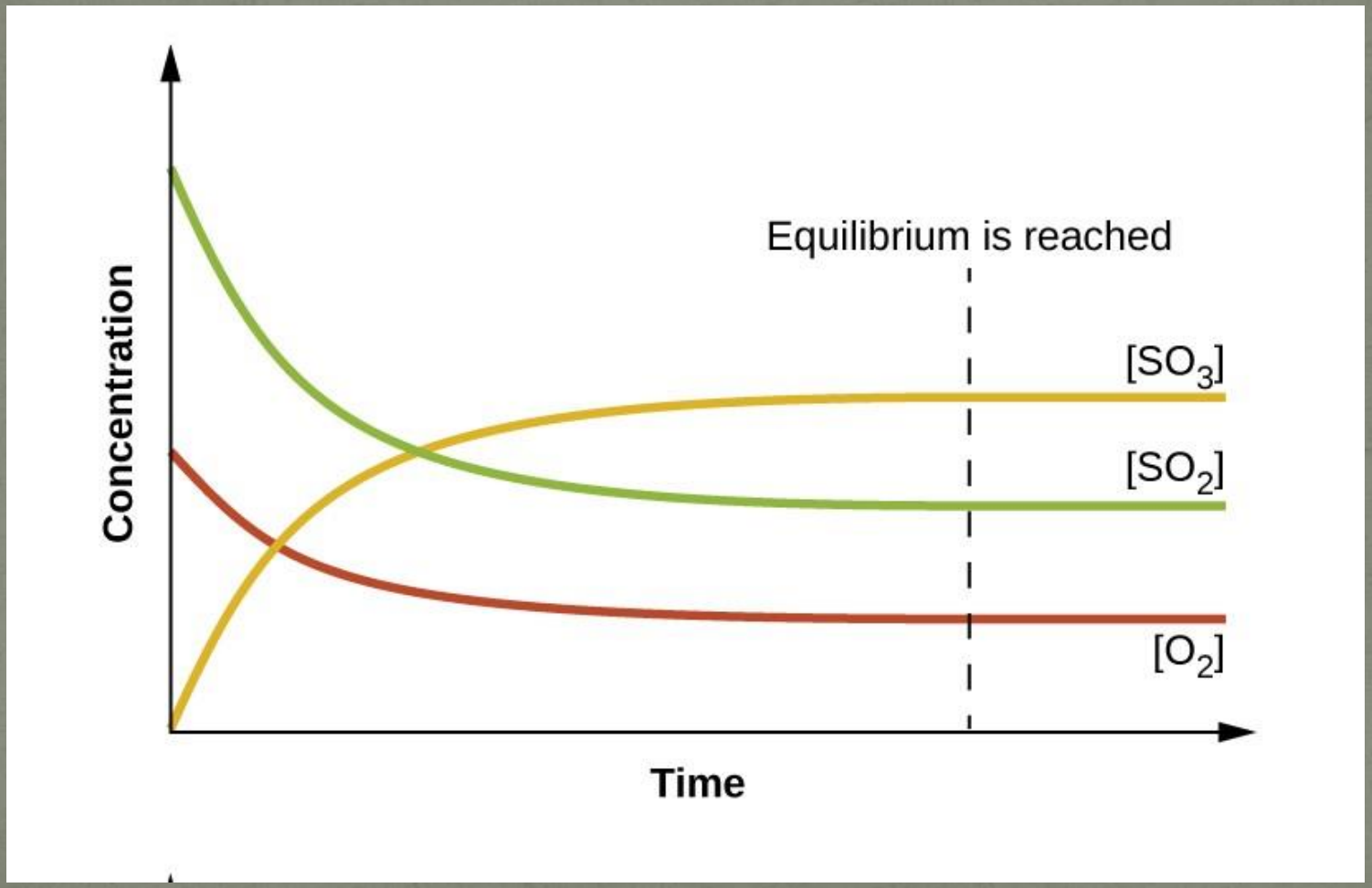
<u>Reverse Reaction:</u>

In the second reaction (from right to left) SO_3 decompose into SO_2 and O_2.

$$2SO_3 \longrightarrow 2SO_2 + O_2$$

- **Equilibrium State:**
- **As the concentration of SO_3 becomes higher, the reverse reaction speeds up. Eventually the two rates become equal. At this stage SO_3 decomposes to SO_2 and O_2 as fast as SO_2 and O_2 produce SO_3 .At this stage reaction is said to have reached equilibrium state.**

Concentration – time graph



Chemical Equilibrium:

When the rates of the forward and reverse reactions are equal, the reaction has reached a state of balance called chemical equilibrium.

Plenary:

- What is reversible reaction?
- In the following reaction tell me the reactants and product?

- One difference between Forward and reverse reaction?

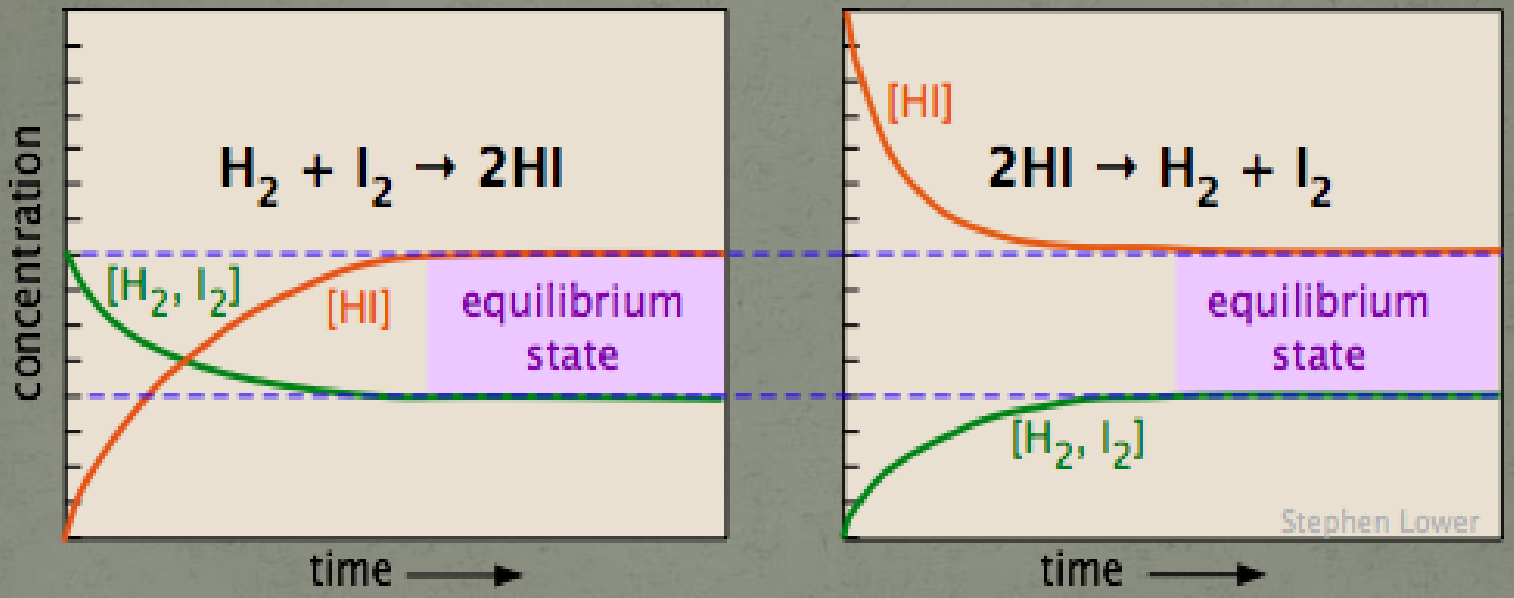
Home Work

- Write both forward and reverse reactions of each:

$$N_2 + 3H_2 \rightleftharpoons 2NH_3$$

$$H_2 + I_2 \rightleftharpoons 2HI$$

- **Explain Concentration Time graph between H_2 and I_2 .**

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