

- Briefly explain how a catalyst works.

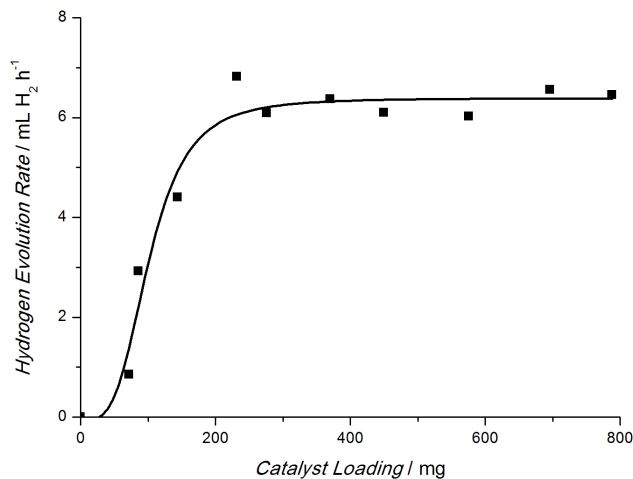
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**A catalyst provides an alternative reaction pathway that has a lower activation energy. This allows the reaction to proceed at lower temperatures or under milder conditions. The catalyst is not consumed during the reaction and does not affect the final position of equilibrium.**

- When irradiated with visible light, CdS can catalyse the production of H<sub>2</sub> from water.



The rate of H<sub>2</sub> production from 80 mL of water at constant illumination varies with the amount of catalyst present (*i.e.* CdS loading) as shown below.



Why does the rate of H<sub>2</sub> production as a function of catalyst loading plateau?

**Energy from light causes the water to split. The energy input is constant and this determines the maximum rate of reaction. (Essentially, light is the limiting reagent.)**

**Increasing the amount of catalyst increases the amount of light captured (0 - 200 catalyst loading), but cannot increase it above the amount being provided (plateau region).**

**THE REMAINDER OF THIS PAGE IS FOR ROUGH WORKING ONLY.**

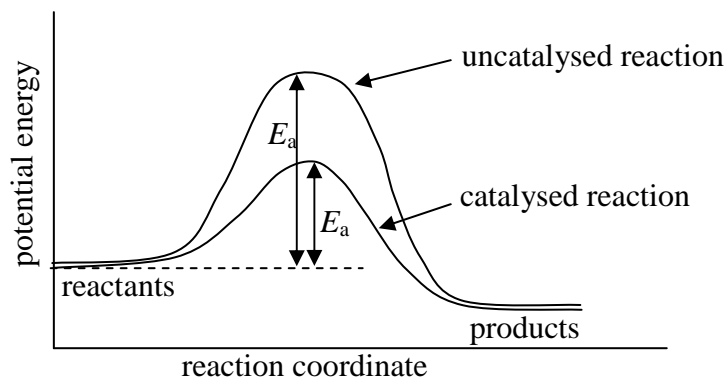
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2**

- What is a catalyst and, in general terms, how does it work? Make reference to an energy level diagram in your answer.

2

**A catalyst is a substance that increases the rate of a reaction without being consumed in the reaction.**

**A catalyst works by providing an alternative reaction pathway of lower activation energy,  $E_a$ .**



- What is a catalyst and, in general terms, how does it work? Make reference to an energy level diagram in your answer.

**A catalyst increases the rate of a reaction and is not consumed by the reaction. Catalysts provide an alternative reaction pathway with a lower activation energy.**

**For the reaction  $A + BC \rightarrow AB + C$ , the energy level diagram below shows the lower activation energy associated with the reaction involving a catalyst.**

