Unit 4, Lesson 07: Catalysis, Answers to Homework

Page 309: Q 6 – 8

6. For the overall reaction: $\mathbf{2\,A + B_2 \xrightarrow{C} D + E}$

a) The sum of the reaction mechanism adds to give the final equation

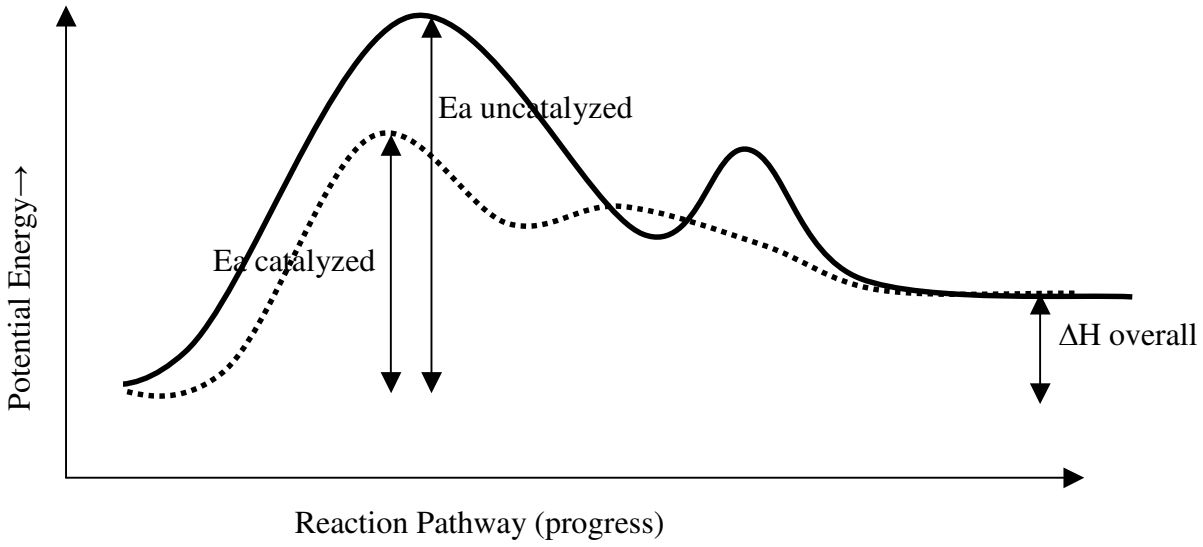
b) AB_2C and AB_2 are reaction intermediates because they are produced in an early step then consumed in a later step and do not appear in the overall reaction

c) C is a catalyst because it is consumed in an early step and regenerated in a later step

d) In general, reaction intermediates are produced in an early step then consumed in a later step while a catalyst is consumed in an early step and regenerated in a later step. A reaction intermediate never appears in the overall reaction, but a catalyst may be shown over the arrow.

7. Mechanism A is consistent with the experimentally determined rate law because the coefficients of the RDS agree with the orders of the reactants in the rate law. The RDS for Mechanism B involves only Cl_2, but the rate law shows that both Cl_2 and H_2S affect the rate of the reaction so this mechanism is not possible.

8a) A catalyst does not affect the overall ΔH for the reaction because enthalpy change is a state function. The catalyst offers an alternative reaction mechanism that has a lower activation energy. This increases the rate of the reaction but does not affect the overall energy change, as shown in the diagram for an endothermic reaction:



b) Similarly, a catalyst will lower the activation energy, but not change the overall ΔH for an exothermic reaction. The diagram will be similar to the one above, but the products will have lower enthalpy than the reactants.