

CH302H – Principles of Chemistry II: Honors
Fall 2016, Unique 49420

Homework, Week 15

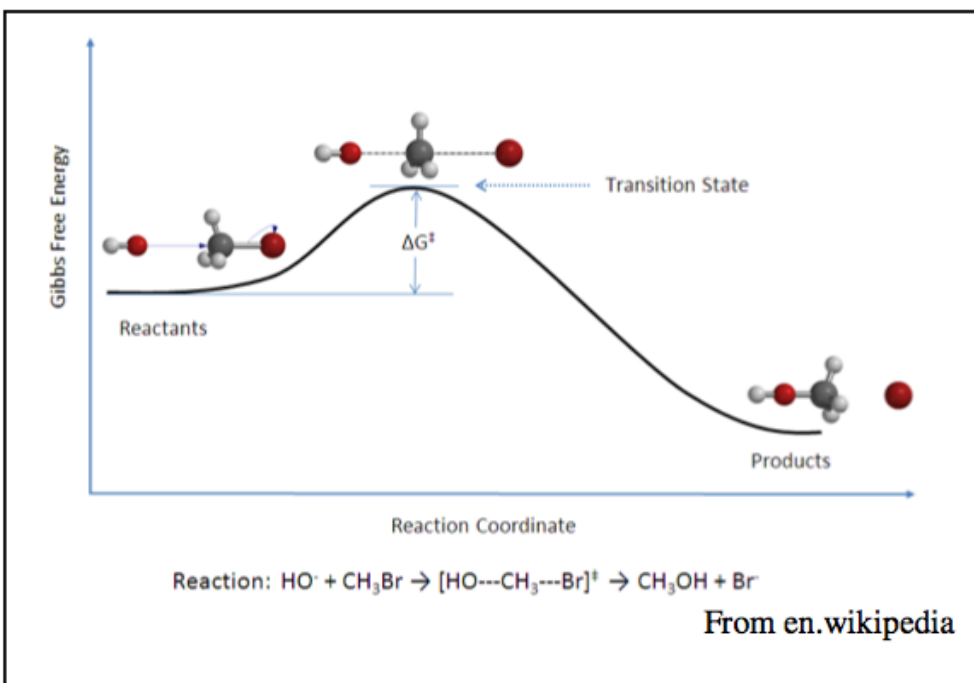
1. Gases adsorb to surfaces through two different mechanisms: physisorption, which relies on noncovalent intermolecular attractions, and chemisorption, which involves the formation of chemical bonds between the gas and the surface.

a) Which is the stronger gas-surface interaction: physisorption or chemisorption? Justify your answer.

b) To remove the gas from the surface, it is necessary to heat it to cause so-called desorption. Which would you predict would have the larger enthalpy of desorption, a physisorbed molecule or a chemisorbed molecule? Justify your answer.

c) The temperature at which significant desorption rates begin are not as different as one would expect based on the differences in the enthalpy of desorption discussed above. Using transition state theory, explain why this might be the case.

2. The transition state that is formed with hydroxide collides with methyl bromide is shown below.



a) How would the presence of a catalyst change this figure? Be specific.

b) How would a catalyst change ΔS° , ΔH° , and ΔG° of this reaction?

3. A certain reaction has an activation energy of 50.0 kJ mol^{-1} . If the temperature is increased from 298 K to 340 K, how much faster will this reaction proceed? What assumptions are you making to answer this?
4. At an elevation where water boils at 92°C , a “three minute egg” actually requires 5 minutes to cook. Estimate the activation energy for cooking the egg.
5. Synthetic organic chemists trying to prepare new compounds follow the general axiom that reaction rates double for every increase of 10°C in temperature. Assuming a reaction starts at 25°C , what activation energy is assumed by this axiom? Based on your answer to question 4, is this reasonable?