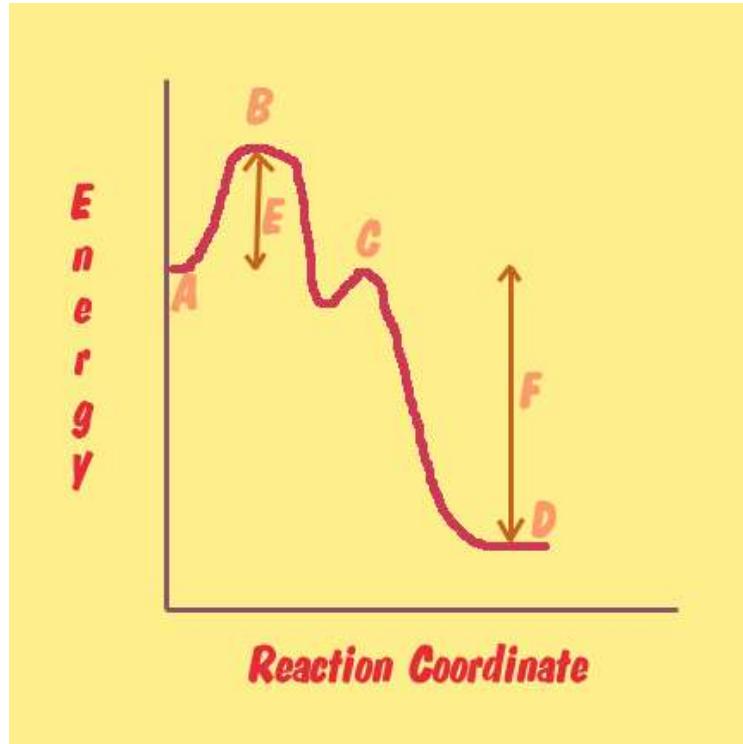


## CHEM 220 Problem Set 4

- 1) Write the hydration reactions for the following alkynes using sulfuric acid and mercuric sulfate. Write out the organic reactant structures and all of the organic products.  
a) ethyne      b) propyne      c) butyne      d) 2-butyne  
e) pentyne      f) 2-pentyne      g) 3-pentyne      h) hexyne
- 2) Write out the mechanisms for a,b,c,e,h in #1, above.
- 3) Write out the mechanisms for d,f,g in #1, above.
- 4) What is the purpose of the sulfuric acid in these reactions?
- 5) What is the difference between “regular” glass and Pyrex or Kimax?
- 6) Describe (using sketches) Zone Purification of Si cylinders.
- 7) Write out the synthesis, including mechanism, of the amides of the following carboxylic acids:  
a) Ethanoic acid      b) Propanoic acid      c) Butanoic acid  
d) Pentanoic acid      e) Hexanoic acid      f) Heptanoic acid  
g) Benzoic acid      h) trans-cinnamic acid      i) Salicylic acid
- 8) Draw the structures for the first 5 cyclo-alkanes.
- 9) Explain the structure of benzene and how the sigma and pi electrons contribute to its structure. Sketches are good.
- 10) Beginning with benzoic acid, indicate where the following substituting groups will locate on the benzene ring:  
a) -OH      b) -Cl      c) -F      d) -NH<sub>2</sub>  
e) -CH<sub>3</sub>      f) -COOH      g) -Br      h) -I  
i) -ONO<sub>2</sub>      j) (CH<sub>3</sub>)<sub>3</sub>N<sup>+</sup>      k) -C<sub>6</sub>H<sub>5</sub>      l) -
- 11) Beginning with toluene, indicate where the substituting groups indicated in #10 will locate on the benzene ring.

- 12) What is Hückel's Rule? What compound has the Hückel hextet? Why is this called the Hückel hextet?
- 13) Explain the labeled parts of the following Energy vs Reaction Coordinate Curve:



- 14) Which hydrogen atom is easiest to extract?
- 15) Which hydrogen atom is most difficult to abstract?
- 16) Which hydrogen atom is roughly in between in terms of difficulty of extraction?
- 17) How do catalysts impact reactions in an energetic manner?
- 18) Intermediates with small  $E_a$ 's have intermediates that more closely resemble what?
- 19) Intermediates with large  $E_a$ 's have intermediates that more closely resemble what?
- 20) The smaller the  $E_a$ 's, the \_\_\_\_\_ the reaction; the \_\_\_\_\_ the  $E_a$ 's the slower the reactions.