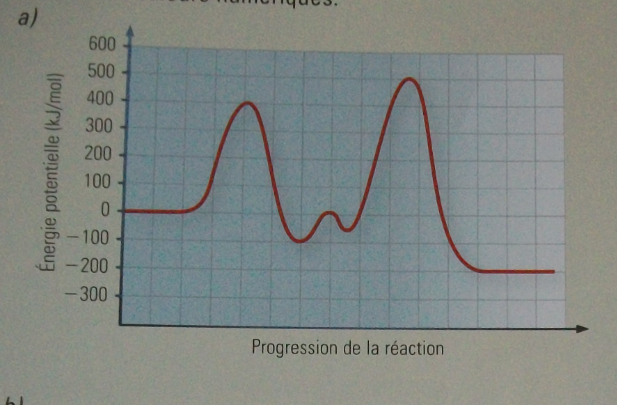
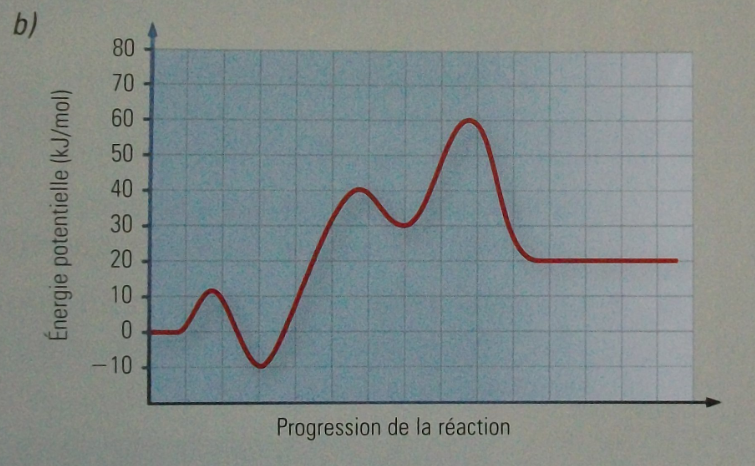
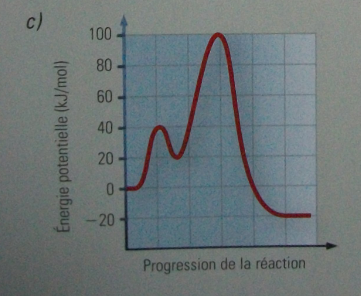
**Chem Review: A Set of Offbeat and Easier Questions for 2013 (for solutions, see June exam center on web site)**

1. For each of the following reactions:
2. Give the number of steps in each reaction. (each step has its own activation energy)
3. Find the value of the highest activation energy.
4. Out of the two or three steps that each reaction has, which is most likely to be the slowest?
5. Is the overall reaction exothermic? What is the overall H?







1. The May 6th 2013 edition of the Economist ran an interesting story about the American chestnut which was almost wiped out in the 20th century. A fungus infecting Chinese chestnuts spread to indigenous trees, killing almost 2 billion of them.

The story goes on to report about how a combination of hybridization and genetic engineering may allow the American chestnut to make a comeback.

The fungus kills because it secretes oxalic acid.

|  |  |  |  |
| --- | --- | --- | --- |
| Oxalic (1) | H2C2O4 | Oxalate ion HC2O4- | KA= 5.9 x 10-2 |

1. Write an equation and calculate the pH of a 1.0 M solution of H2C2O4
2. Biologists have isolated a gene from wheat which produces and enzyme than then converts oxalate to carbon dioxide.

Show a distribution of kinetic energies for the breakdown of oxalate with and without the enzyme.

1. They have also incorporated the oxalate gene into a plasmid and have fooled the American chestnut into incorporating the gene into its own DNA.

What will the chestnut start doing? How will this help it survive the fungus?

1. By the way, is the conversion of HC2O4- to CO2an oxidation? Show why or why not.
2. If another acid has a KA of 5.1 X 10-3, how does its strength compare to that of oxalic acid?
3. Why can’t pH be used to compare the relative strengths of two different acids?
4. a) How many grams of Tl(OH)3 will you find in 50.0 ml of a saturated solution? Its Ksp is a whoppingly-low 1.68 X 10 -44.

b) What effect will the addition of acid have on the above equilibrium?