

Thermodynamics - study of chemical energy

Why in bio III?

major goal of living things is controlling chemical reactions

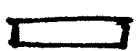

ex I want to digest my lunch into monomers

① not too atoms ② sometime soon

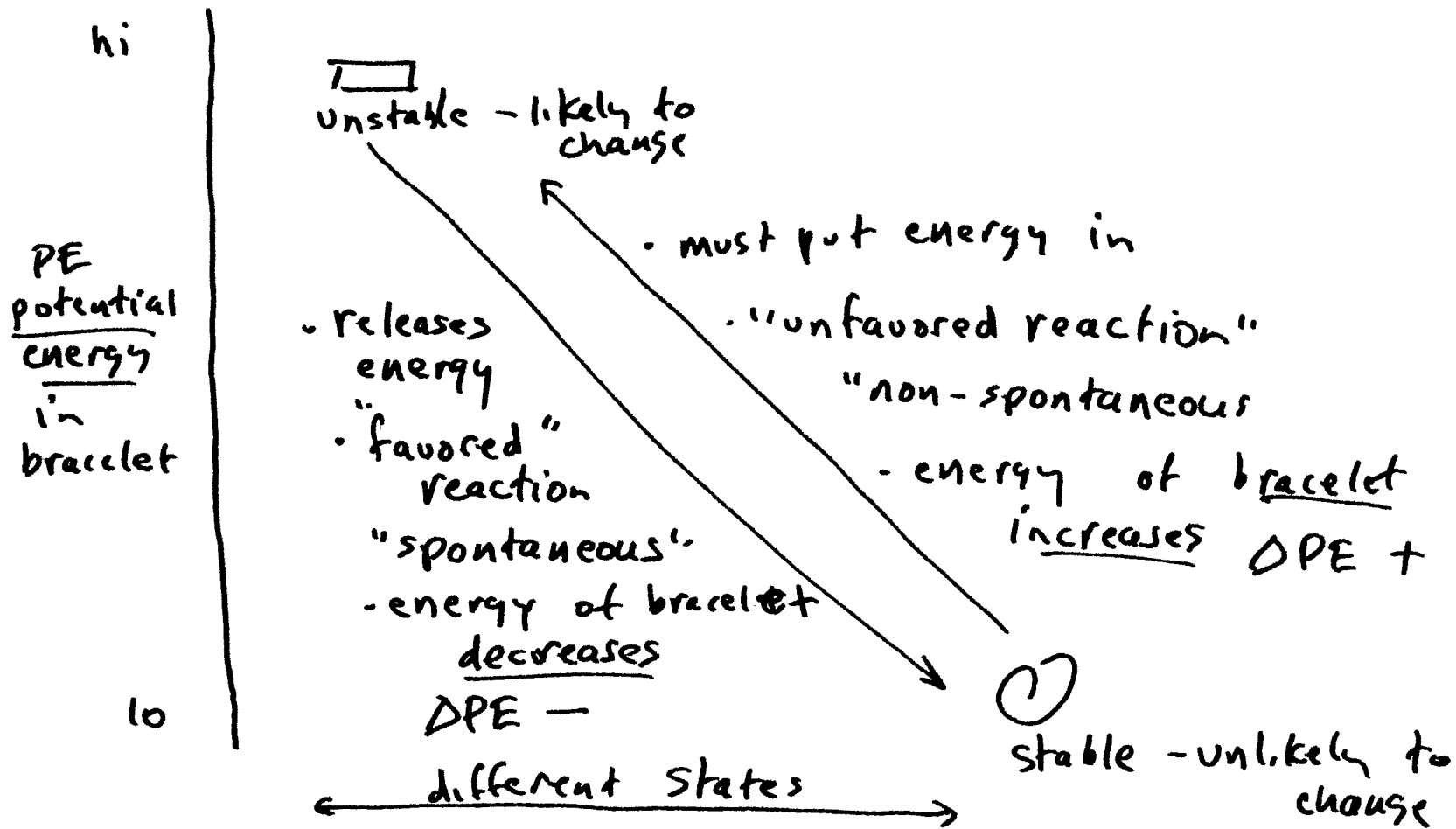
∴ need to control ① which reactions happen

∴ ② how fast

Illustrative example "slap bracelets"

2 states :  straight ①  coiled

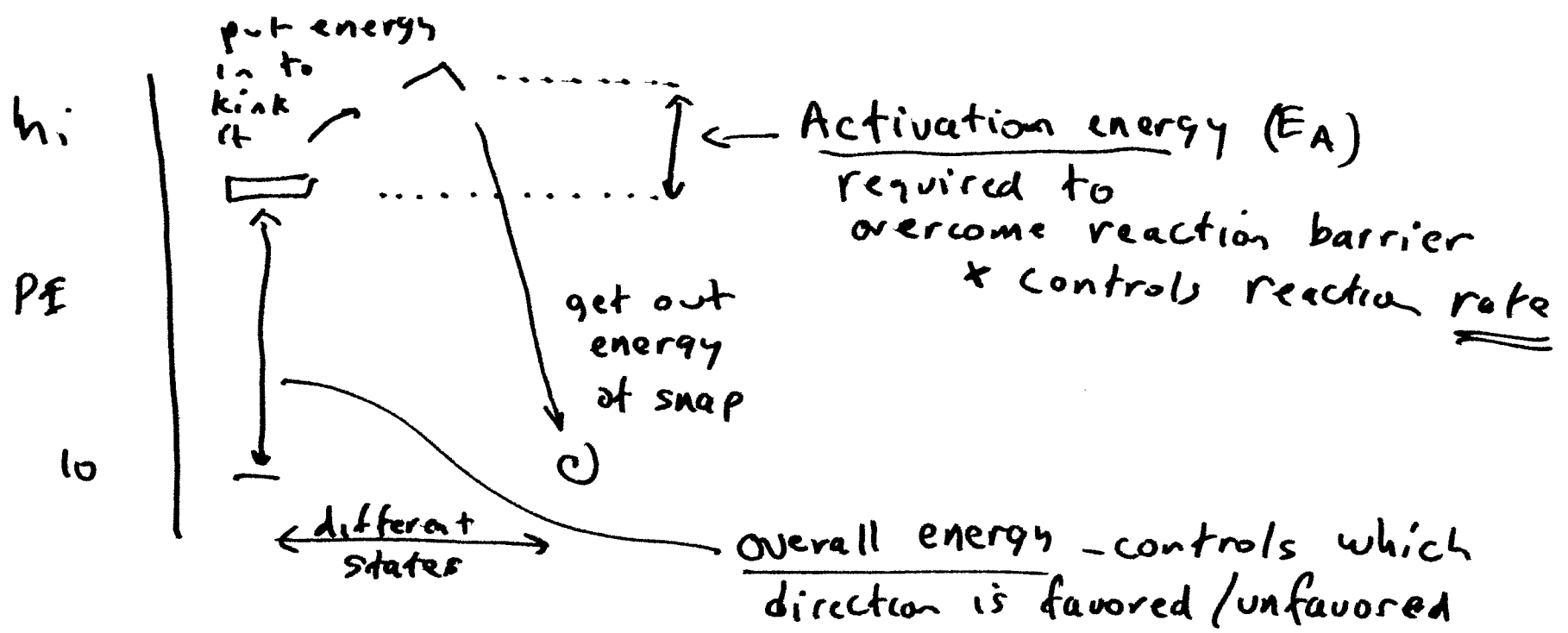
Δ (delta)
= change in



Q: if $\square \rightarrow \bigcirc$ is favored - why doesn't it snap in your hand?

A: need to "put a kink in it" to start it off

\therefore transient 3rd state - kinked \wedge - where on chart?



Rate * not ~~how~~ how fast each bracelet snaps
 but how often bracelets snap

3 situations

- ① box sitting still : rate = 0
- ② box shaking a little : rate = low
- ③ box shaking a lot : rate = high

real world
 temperature
 absolute zero
 warm
 hot

why? more shaking \Rightarrow more \square have enough energy to kink \Leftarrow then snap \Rightarrow faster rate

∴ heating increases rate of ~~all chemical reactions~~
favored reaction

Q: can heat make unfavored rxn happen?

A: NO - heat energy is not ~~useful~~ useful here
heat is random motion
more shaking wont $G \rightarrow \square$

connection to real world

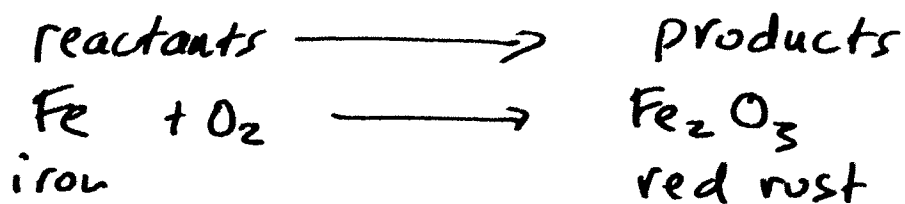
"potential energy in bracelets" = "chemical potential energy in molecules"

= Gibbs' free energy "G"

$\Delta G -$ = favored

$\Delta G +$ = unfavored

ex. rusting iron (hot packs)



$\Delta G = -200 \text{ kcal/mol}$
change in free energy
∴ favored
units

