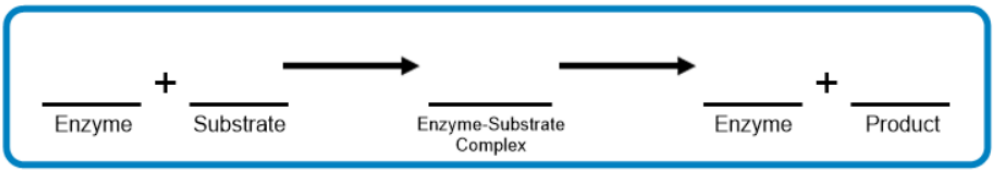
CONCEPT: ENZYME-SUBSTRATE COMPLEX

●Enzyme-substrate _____ (ES): an *intermediate* formed when an enzyme binds to its substrate.

●Recall: _____ are *transient* molecules at local _____ energy points within a *multistep* reaction.

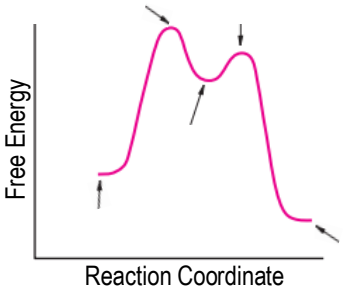
□ ES interactions are *predominantly* mediated by _____ forces.

□ Weak noncovalent forces between enzyme & substrate provide the driving force for enzyme _____.



EXAMPLE: Appropriately label the arrows in the reaction energy diagram below using the provided terms.

a) Product (P).
b) Intermediate (I).
c) Substrate (S).
d) Non-rate-limiting transition state (‡).
e) Rate-limiting transition state (‡).



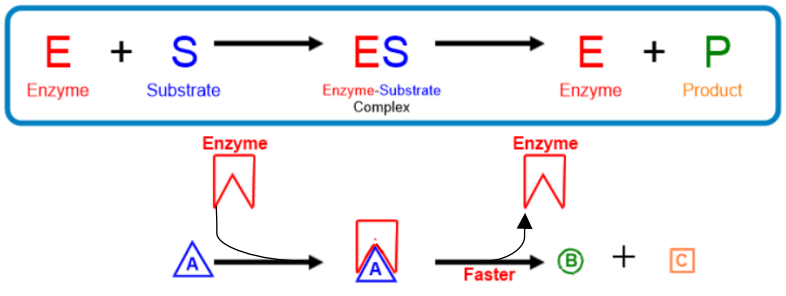
Binding Energy

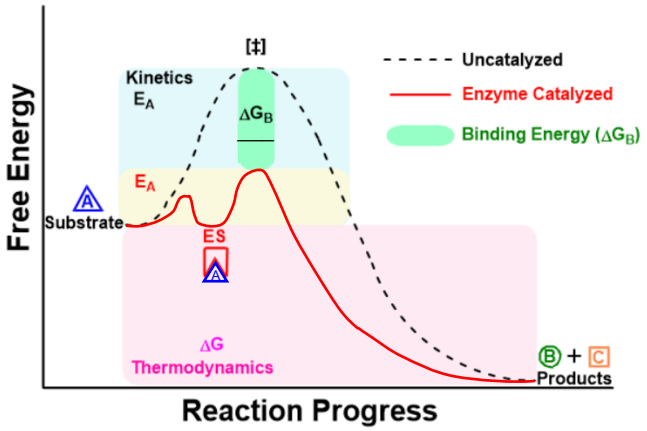
●_____ *energy* (ΔG_B): energy difference between uncatalyzed & _____ transition states.

□ Derived from the _____ of free energy when noncovalent interactions form in the ES complex.

●Enzymes lower the E_A by utilizing *binding energy* to _____ the transition state in the active site.

EXAMPLE:





PRACTICE: What can the binding energy (ΔG_B) of an enzyme catalyzed reaction tell us?

a) The change in the rate/speed of the reaction.
b) The change in the equilibrium constant (K_{eq}) of the reaction.
c) The change in the reaction E_A between the catalyzed & uncatalyzed transition states.
d) a & c.
e) All options are true.

CONCEPT: ENZYME-SUBSTRATE COMPLEX

PRACTICE: Which is the best definition of binding energy regarding enzyme catalysis?

a) Energy absorbed by the enzyme upon its binding to the substrate.
b) Energy released by interactions between the enzyme's active site & substrate.
c) Energy released by the products of an enzyme.
d) The difference in energy between the substrates & products.

PRACTICE: Which of the following is true of the binding energy derived from enzyme-substrate interactions?

a) It does not provide enough energy to explain the rate accelerations brought about by enzymes.
b) It is the result of covalent bonds formed between the enzyme and substrate.
c) It's sometimes used to hold two substrates in the optimal orientation for the reaction to occur.
d) Most of the binding energy is used up by cofactors.