CHAPTER 2- ENZYMES

- BIOL. 1 AB
- KENNEDY

PROTEINS

- A. DEFINITION- LARGE MACROMOLECULES MADE OF CARBON, HYDROGEN, NITROGEN, OXYGEN, AND SULFUR
- THEIR PRIMARY BUILDING BLOCK IS THE AMINO ACID
- THEY FUNCTION AS BUILDING BLOCK WITH IN THE ORGANISM OR EVEN ENZYME AND TRANSPORT MOLECULES
- AVERAGE 200 AMINO ACIDS PER PROTEIN

B. AMINO ACID-

- PRIMARY BUILDING BLOCK OF PROTEIN
- 20 DIFFERENT TYPES
- ALMOST ENDLESS COMBINATION OF A.A.S YIELDING A WIDE VARIETY OF PROTEIN MOLECULES

C. DIPEPTIDE-

- FORMED BY THE BONDING OF ONLY TWO AMINO ACIDS
- NOT NORMALLY FUNCTIONAL PROTEIN

D. POLYPEPTIDE-

- FORMED FROM THREE OR MORE AMINO ACIDS BINDING TOGETHER, MOST COMMON
- EXAMPLE:HEMOGLOBIN

I. CELL CHEMISTRY

- A. ENERGY OF ACTIVATION-- THE ENERGY REQUIRED TO BEGIN A REACTION
- VARIES BY REACTION

1. INCREASING TEMPERATURE--

- THIS THE SIMPLEST WAY TO PROVIDE CHEMICALS WITH THE ENERGY THEY NEED IN ORDER TO REACT

2. CATALYSTS (ENZYMES)

- SINCE A TEMPERATURE CHANGE IS NOT ALWAYS POSSIBLE ENZYMES CAN PROVIDE THE NEEDED CHANGE TO ALLOW A REACTION TO OCCUR
- ENZYMES DON'T PROVIDE ENERGY, THEY LOWER THE AMOUNT OF ENERGY REQUIRED

B. ENZYMES--PROTEIN CATALYSTS--

- ENZYMES ARE TERTIARY PROTEINS
- ENZYMES ARE PROTEIN MOLECULES THAT BIND TO THE REACTANTS
- THEY LOWER THE REACTIONS ACTIVATION ENERGY AND CAUSE IT TO GO FASTER

1. TEMPORARY BINDING

- THE BOND FORMED BETWEEN THE ENZYME AND THE REACTANTS OR SUBSTRATE IS ONLY TEMPORARY
- THE ENZYME REMAINS UNAFFECTED

A. LOWERING ENERGY OF ACTIVATION.

- ENZYMES LOWER THE ACTIVATION ENERGY BY CHANGING THE SHAPE OF THE SUBSTRATE
- IT PLACES A STRAIN ON THE BONDS OF THE SUBSTRATE

B. ENZYMES ARE VERY SPECIFIC-- LOCK/KEY

- EACH ENZYME WILL ONLY BOND TO A SELECT SUBSTRATE
- THEY FIT TOGETHER AS A LOCK AND KEY

C. REVISED HYPOTHESIS-- INDUCED FIT

- RECENTLY IT WAS DECIDED THAT THE FIT IS MORE LIKE A HAND IN GLOVE RATHER THAN A LOCK AND KEY
- THIS MEANS THAT ONE ENZYME CAN INFLUENCE MORE THAN ONE SUBSTRATE AS WELL

D. ENZYMES ARE RAPID--

- THEY WILL BIND TO THE SUBSTRATE CATALYZE THE REACTION AND MOVE TO THE NEXT REACTION AGAIN VERY QUICKLY

E. ENZYMES ARE REQUIRED IN SMALL AMOUNTS--

- IT ONLY TAKE TINY AMOUNTS OF AN ENZYME TO SUCCESSFULLY SPEED UP A REACTION
- AS SMALL AS 1 PART PER MILLION

G. COMPETITIVE INHIBITION--

- MEANS OF REGULATING AN ENZYME

1). DEFINITION

- TWO OR MORE SUBSTRATES CAN COMPETE FOR THE SAME ACTIVE SITE ON AN ENZYME

2). EXAMPLE

- EXAMPLE: CARBON MONOXIDE ON HEMOGLOBIN
- CARBON MONOXIDE WILL FIGHT FOR THE SAME ACTIVE SITE THAT OXYGEN NORMALLY BINDS TO ON THE HEMOGLOBIN MOLECULE

C. REQUIREMENTS FOR ENZYME ACTIONS

- ENZYMES WILL ONLY WORK WITHIN SPECIFIC TEMPERATURE AND PH RANGES
- ANY EXTREME IN THESE WILL DESTROY THE ENZYME

1. ENZYMES ARE PROTEINS

- THEY ARE BOUND BY THE RESTRICTIONS THAT INFLUENCE ALL OTHER BIOMOLECULES
- EXAMPLES: TEMPERATURE, AND PH

A. DENATURE PROTEIN--

- DENATURE MEANS DESTROY
- WHEN A PROTEIN IS DENATURED IT WILL NO LONGER FUNCTION

2. ENZYMES NEED COFACTORS--COENZYMES

- IN ORDER TO WORK CORRECTLY ENZYMES NEED SOME HELP
- COFACTORS AND COENZYMES PROVIDE THAT HELP
- THEY ARE EITHER INORGANIC OR ORGANIC MOLECULES THAT INCREASE AN ENZYMES EFFICIENCY

D. REGULATION OF ENZYMES

- **ENZYMES CAN BE REGULATED THROUGH THE USE OF REGULATORY MOLECULES BINDING TO SPECIFIC LOCATIONS ON ENZYMES CALLED REGULATORY OR ALLOSTERIC SITES**

1. INHIBITING FACTORS

- **INHIBITING FACTORS WILL STOP AN ENZYMES NORMAL FUNCTION BY BINDING TO THE ALLOSTERIC SITE**

A. EXAMPLE--

- MALTOSE + MALTASE 2 GLUCOSE

2. REGULATORY MOLECULES

- REGULATORY MOLECULES CAN BE THE PRODUCTS OF THE REACTION OR MOLECULES THAT ARE NOT EVEN ASSOCIATED WITH THE REACTION

3. FEEDBACK INHIBITION:

- A. DEFINITION THE PRODUCTS OF THE REACTION FEED BACK TO THE REACTANTS AND STOP THEIR OWN PRODUCTION

L) EXAMPLE

- MALTOSE + MALTASE 2 GLUCOSE

4. PRECURSOR ACTIVATION:

- SOME ENZYME WILL NOT WORK UNLESS THEY HAVE BEEN ACTIVATED BY BINDING WITH ANOTHER MOLECULE
- AFTER ACTIVATION THEY WORK AS NORMAL

5. DNA REGULATION:

- DNA REGULATES ALL OF THE FUNCTIONS OF THE CELL THROUGH THE PROTEINS THAT IT CODES FOR AND THE ENZYMES THAT ARE PRODUCED

A. ACCUMULATION OF ENZYME

- ENZYMES CAN BE ACCUMULATED TO BE USED AT A LATER TIME

B. ACCUMULATION OF SUBSTRATE

- THE SUBSTRATE CAN BUILD UP PREVIOUS TO THE REACTION TAKING PLACE

2) ACCUMULATION OF PRODUCT= INHIBITION OF ENZYME

- **THE BUILD UP OF THE PRODUCT WILL SOMETIMES SLOW OR STOP THE REACTION**