Enzymes Beginning

Enzyme	This is basic definitions for enzyme
	Is a catalyst basically substance that speeds up a reaction without being consumed
	Are proteins are reusable
	Work in low concentrations
	Speed up reaction rate
	Allow reactions to proceed at lower temperatures than they would normally occur
	Reactants that enzymes act upon is known as substrates
	Enzyme work by forming very temporary complex with substrate
	This is called enzyme substrate complex
	Are large globular proteins
	Very specific 3d shapes tertiary structure
	They have groves or pockets which contain chemically functional groups
	(Relating to above definition) These are called active sites, this is where substrate attaches

What goes into what

If amylase added	Starch ---> Glucose
If lipase added	Lipids ---> Fatty acids and glycerol
If protease added	Proteins ---> Amino Acids

Feedback Inhibition & control of metabolic rate

Feedback inhibition

When concentration of final product gets low again there will be less inhibition on the enzymes and the metabolic pathway is reactivated

Thyroxin the hormone that controls the metabolic rate of all of the cells in your body, is producde by the hyroid gland in the neck

Thyroid gland is stimulated to release thyroxine by a hormone produced in the pituitary gland called TSA (thyroid stimulating hormone)

Enzymes in cell of the pituitary that make TSH are inhibited by thyroxin

Therefore if thyroxin levels are high the pituitary stops producing THS and if thyroxin levels are low the pituitary makes the TSH

Thus metabolic rate of cells in your body are maintained by the feedback inhibition of an enzyme

Metabolism and ATP

Metabolism and ATP

Most cell reactions (Metabolism) require energy to occur.The energy 'currency' of cells is a molecule called ATP

ATP has 3 phosphates the last two of which are held together by a high energy bond

It takes a lot of energy to make this phosphate bond and energy is released when bond breaks

Lock and Key Model

Lock and Key Model	This model is now incorrect
	Enzymes have goove shapes and chemical groups

Lock and Key Model (cont)

Groove shapes and chemical groups are in active site

Therfore enzymes can only bond with one specific substrate or reactive

When substrate and enzyme join together the shape of the enzyme changes which makes it more reactive

This is called induced fit not one to one

Why Wrong

Because there can be more than one substrate

Anabolism & Catabolism Metabolism

Anabolism & Catabolism

The active site of an enzyme is not an exact perfect fit to substrate

When substrate attaches to enzyme this causes stress in the substrate which causes

Catabolism:Is when substrate to break apart in a hydrolysis reaction molecules into smaller ones

Anabolism:When two substrates to form a bond in a synthesis reaction putting small molecules together to make bigger ones

Anabolism + Catabolism = Metabolism

Metabolism

Metabolism is the constantly occurring chemical reaction that take place in a cell

These chemical reactions occur in organized sequences from reactants to end products with help of enzymes

This organized sequence of reactions is known as a metabolic pathway

Coenzymes

Coenzymes

Made up of two pieces

Apoenzyme - Protein portion (Inactive)

Co-enzyme - a non-protein porton

When these two pieces join enzyme becomes active

Then substrate will now 'fit' into active site

Coenzymes usually fit into the allosteric site

allosteric site changes the shape of the active site so substrate 'fit'

co-enzymes are often large molecules

co-enzymes usually are things the body can't make on its own

most co-enzymes come from vitamens, which we get from food or supplements

Enzyme Action

Enzyme action

Usally heat can be used to speed up chemical reactions

Heat increases the number of collisions that occur between reactants

Excessive heat, however, destroys the tertiary structure of protein denatures it

So heat cannot be used to speed up reactions within living organisms

Enzymes operate by lowering energy of activation needed for reaction to occur

Enzymes act as catalyst and are not consumed in a reaction

This means they can be used over and over again

Factors affecting reaction rates

Enzyme Action (cont)

Concentration:The amount of enzyme or substrate available to react can affect enzyme activity

The reactions speeds up as substrate increases

It levels out when the enzymes working at the speed (substrate)

So to increase reactions rates add enzymes

Reaction speeds up as you increase substrate the enzyme slows down as the enzymes are working at the maximum speed (Saturation)

Temperature:As temp rises reaction rate will increase cuz enzymes and substrates bump into each other more often (kinetic molecular theory)

The rate of these collisions will be at the fastest rate this is optimum temperature

If you get above the optimum temperature the enzyme becomes denatured (Changes shape) no longer functions properly

Most enzymes have an optimal temperature of 37C (Body temperature)

PH:3D shape of an enzyme can be affected by PH.

All enzymes have an optimal pG to work at depending on where they are in the body

Saliva pH 7

Stomach pH 2.5

Intestines pH 8.5

Vagina pH 3.8-4.0

When pH is too low the positive hydrogen ion with negative r group in protein and tear them away

The denatures the enzyme by changing its shape

Enzyme Action (cont)

When pH is too high the negative hydroxide interact with the positive r groups in protein and tear them away

This denatures the enzyme by changing its shape

Inhibitors:Chemicals that interfere with the enzyme action

Two types of Inhibitors

Competitive inhibitors

Are chemicals that so closely resemble an enzymes normal substrate that it can attach to the enzymes active site.

The substrate and inhibitor compete

If the inhibitor occupies the active site of enzyme substrate will not be able to join and no product will from that enzyme

If inhibitor is removed the enzyme will become active again

Non-Competitive inhibitors

Atoms or molecules that attach to an enzyme at an allosteric site this denatures the enzyme

Will sometimes destroy an enzyme by permanently binding to the allosteric site

examples are:heavy metals, lead in nervous system

Other type of Non-Competitive inhibitor

Inhibition is when a metabolic product can feedback on a metabolic pathway to control how much product is made

Final product can temporarily attach to the allosteric site on the first enzyme

Enzyme will be denatureated and the reaction will stop