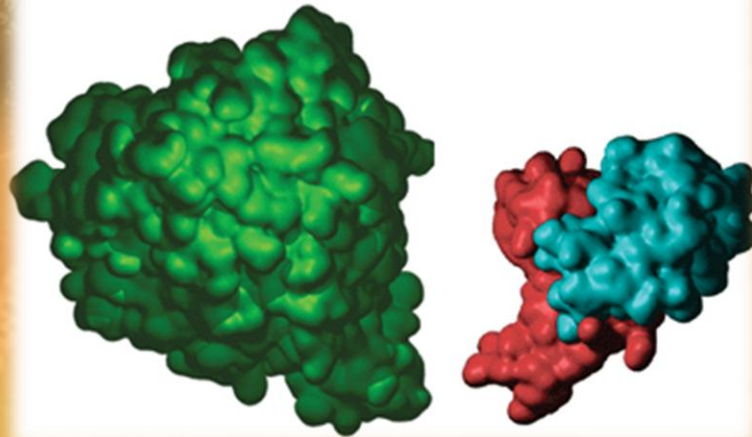


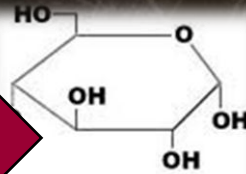
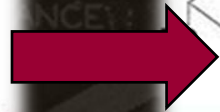
Enzymes

What happens to the food that we eat?



It breaks down into...

Carbohydrates

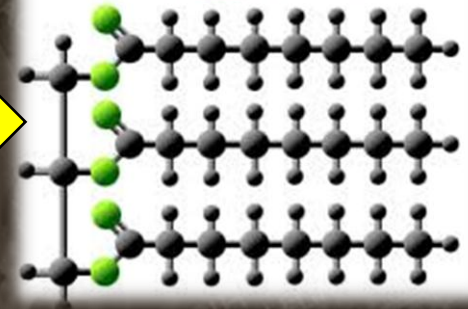


GLUCOSE

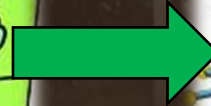
Lipids



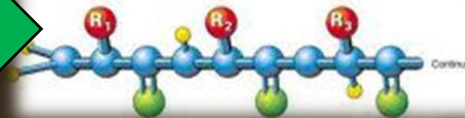
Triglyceride



Proteins

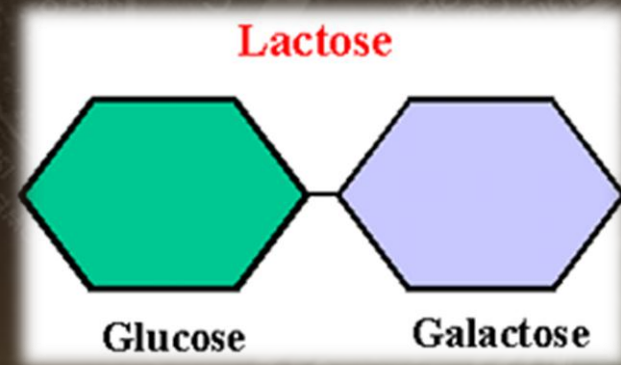


Amino Acid Chain (Protein)



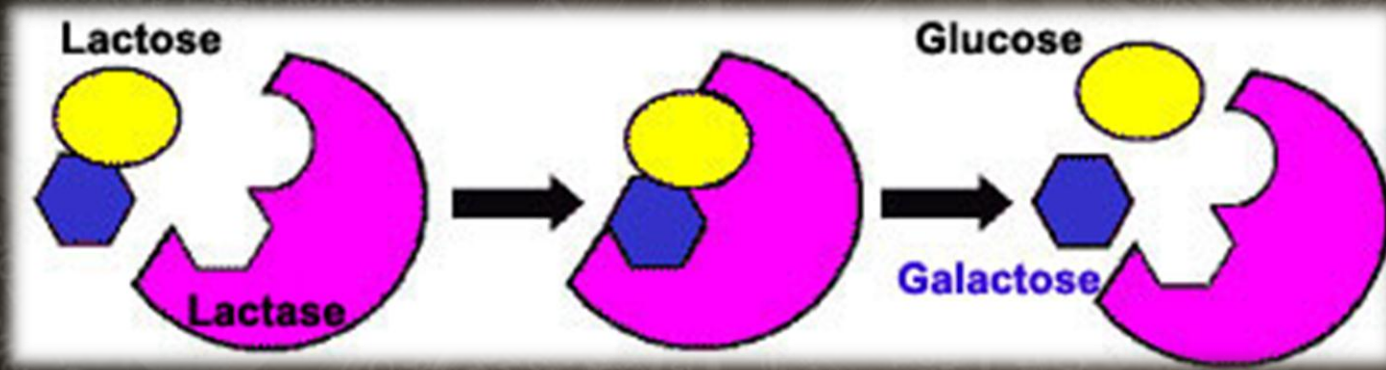
Let's look at... Lactose

- What is lactose?
 - Lactose is a **disaccharide** found in dairy products



What is Lactose-intolerance?

- They lack the enzyme: **LACTASE**

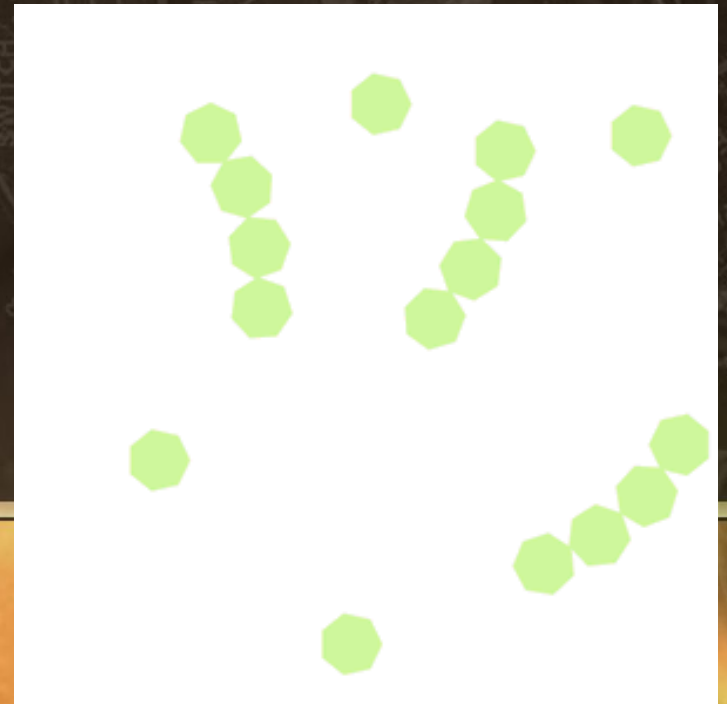
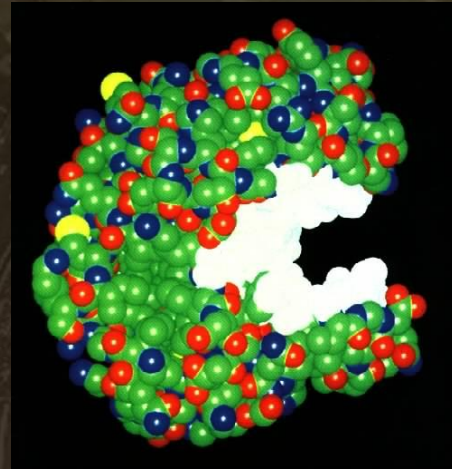


- **Sugars** end in "-ose"
- **Enzymes** end in "-ase"

But...what is an enzyme?

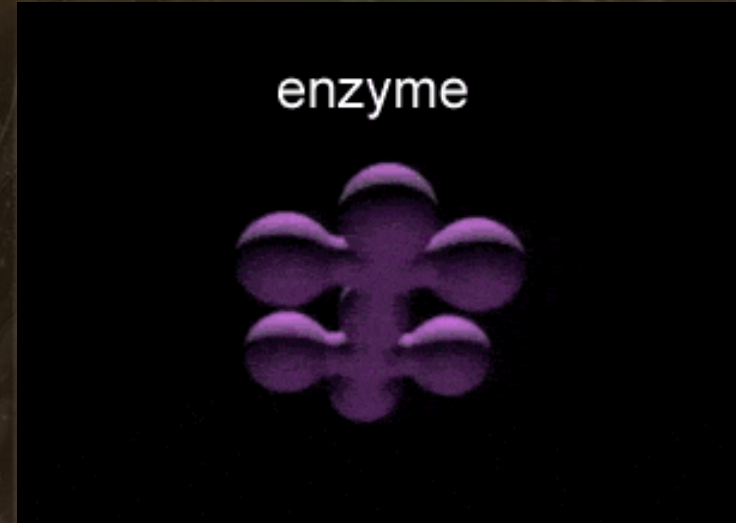
What Are Enzymes?

- Most enzymes are **Proteins**
- Act as **Catalyst** to speed up a **chemical reaction** by helping molecules react with each other faster



Enzymes

- Are specific for what they will **catalyze**
- Are **Reusable**
- End in **-ase**
- Named for the reaction they help:
 - Sucrase breaks down sucrose
 - Proteases breakdown proteins
 - Lipases breakdown lipids
 - DNA polymerase builds DNA



Enzymes aren't used up

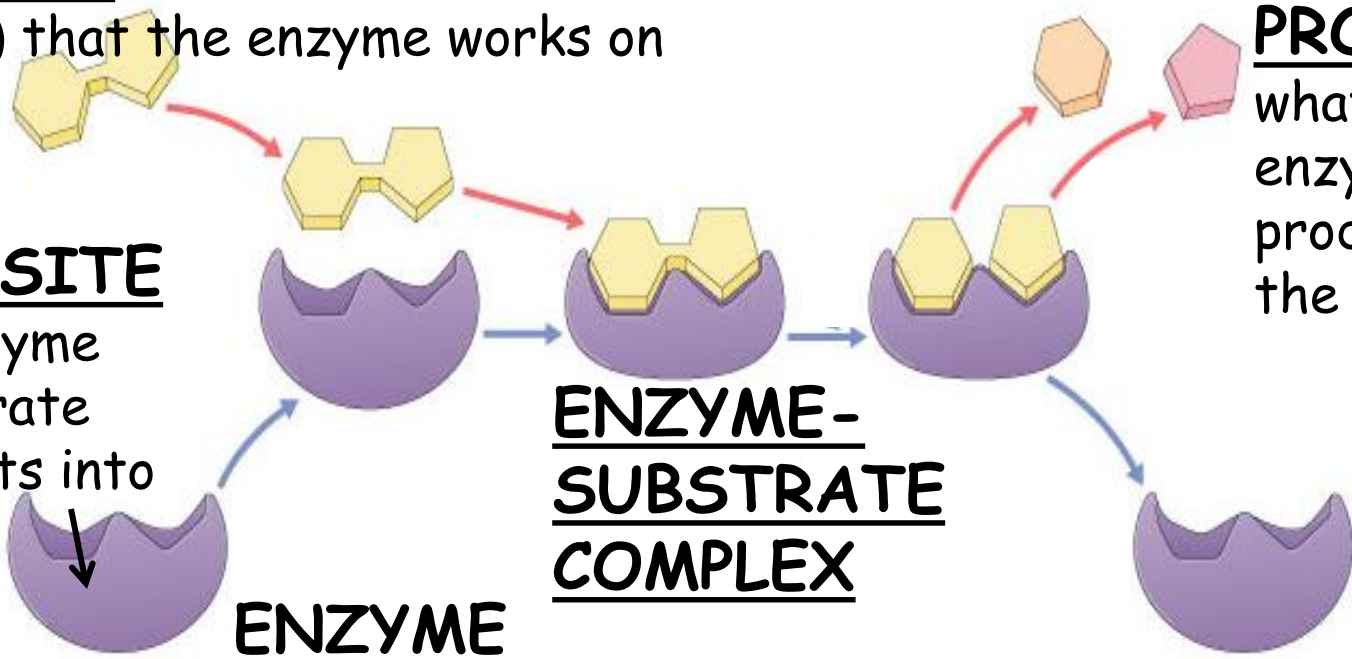
- **re-used** again for the same reaction with other molecules
- very little enzyme needed to help in **many reactions**

SUBSTRATE

Molecule(s) that the enzyme works on

ACTIVE SITE

part of enzyme that substrate molecule fits into



PRODUCT

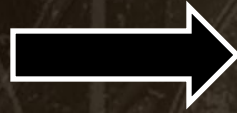
what the enzyme helps produce from the reaction

ENZYME

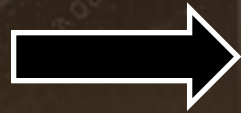
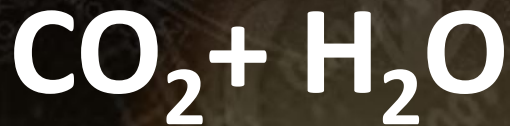
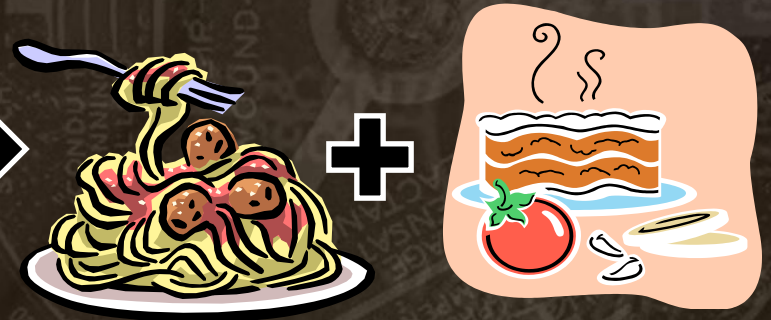
helper protein molecule

Reactants form Products

REACTANTS



PRODUCTS



(carbonic acid)

It's shape that matters!

- Lock & Key model

- **shape** of enzyme allows substrate to fit
- **specific enzyme** for each specific reaction

Chemical Reaction:

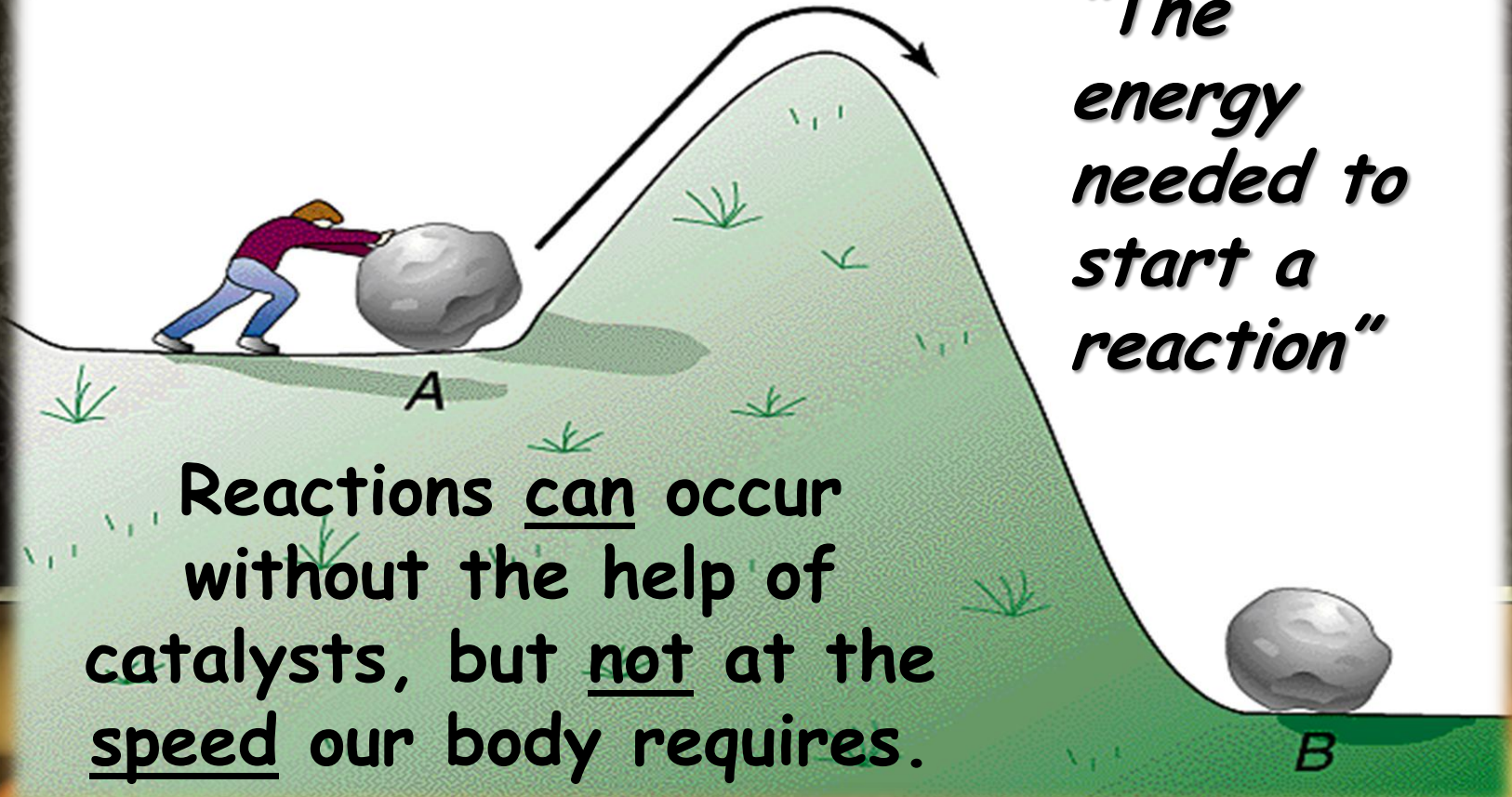
Enzyme + Substrate → Enzyme + Product
REACTANTS PRODUCTS



How do enzymes Work?

Enzymes work by weakening bonds which lowers **activation energy**

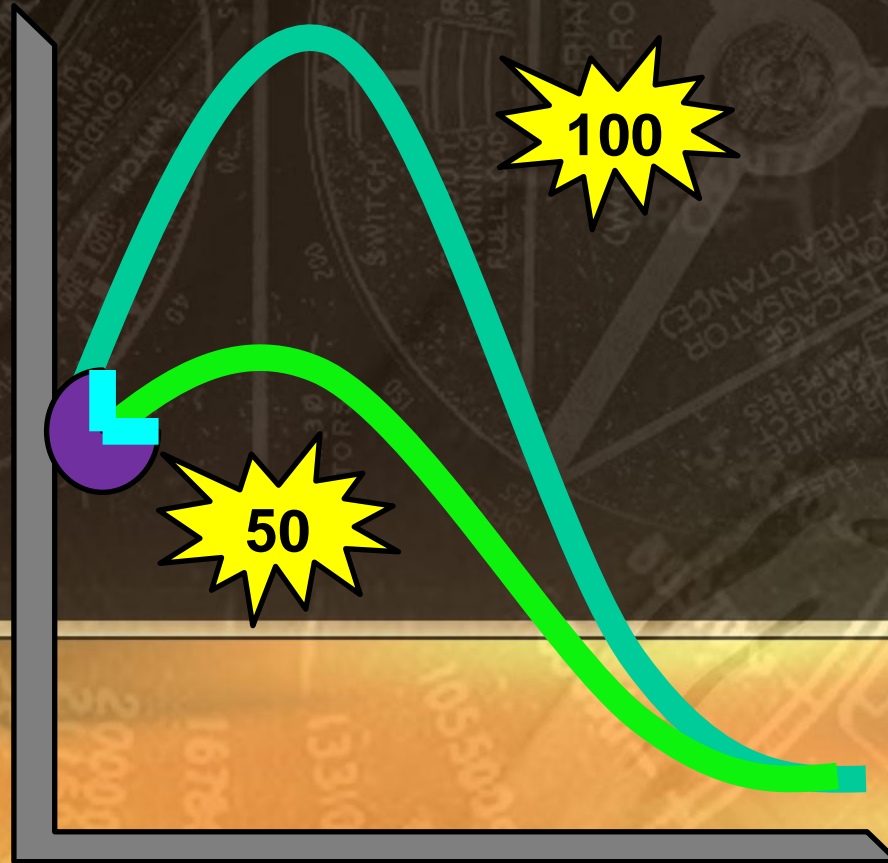
"The energy needed to start a reaction"



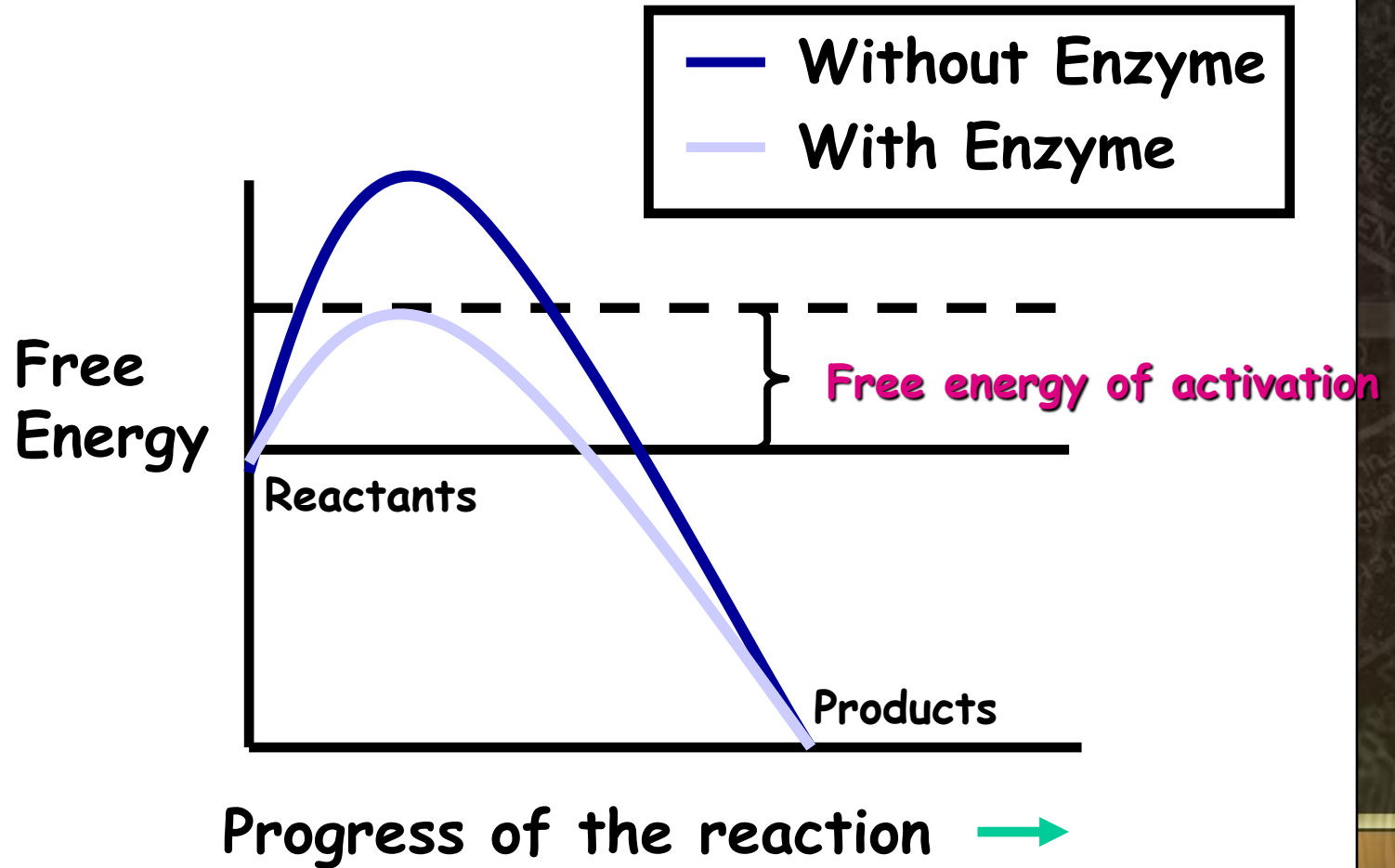
Reactions can occur without the help of catalysts, but not at the speed our body requires.

- Enzymes reduce the energy needed for reaction to occur (energy of activation)
- It is like a discount on the cost of the reaction

- Enzymes reduce the energy needed for reaction to occur (energy of activation)
- It is like a discount on the cost of the reaction



Activation Energy



What Affects Enzyme Activity?

1. Environmental Conditions

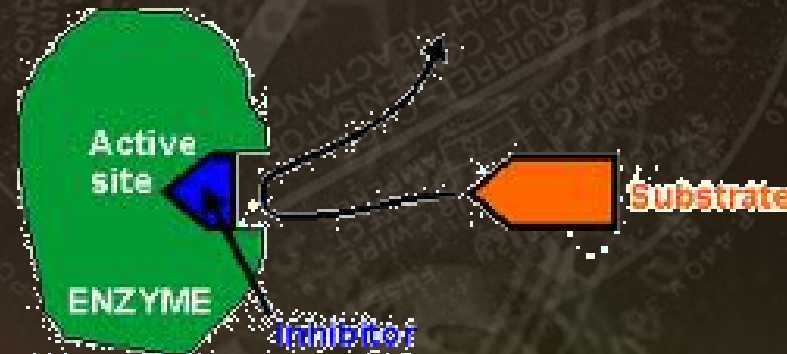
-pH, temperature, enzyme or substrate concentration

2. Cofactors and Coenzymes

-substances needed for the enzyme to work

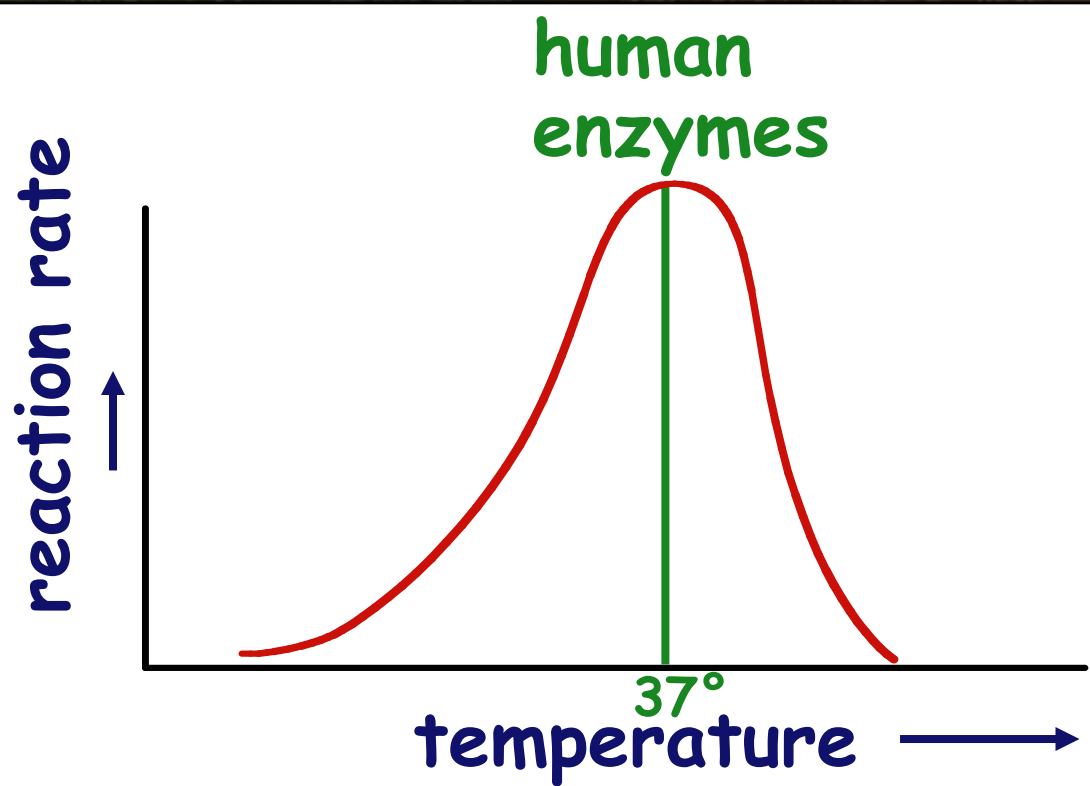
3. Enzyme Inhibitors

-bind and block the enzyme from working



Temperature

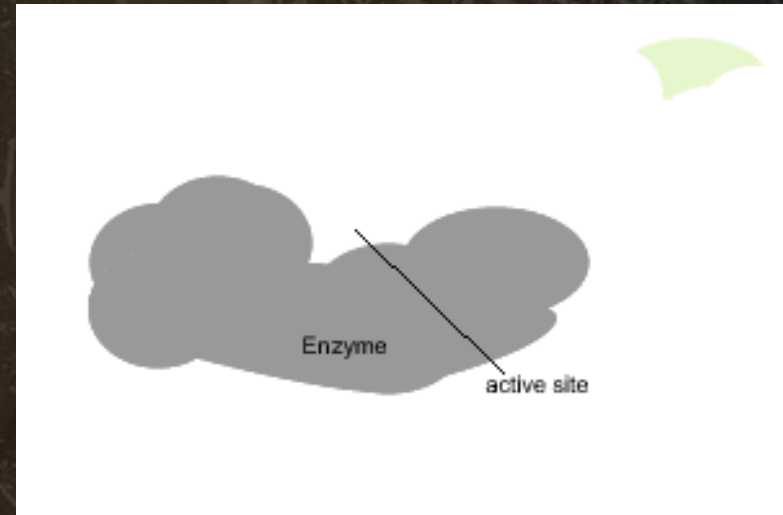
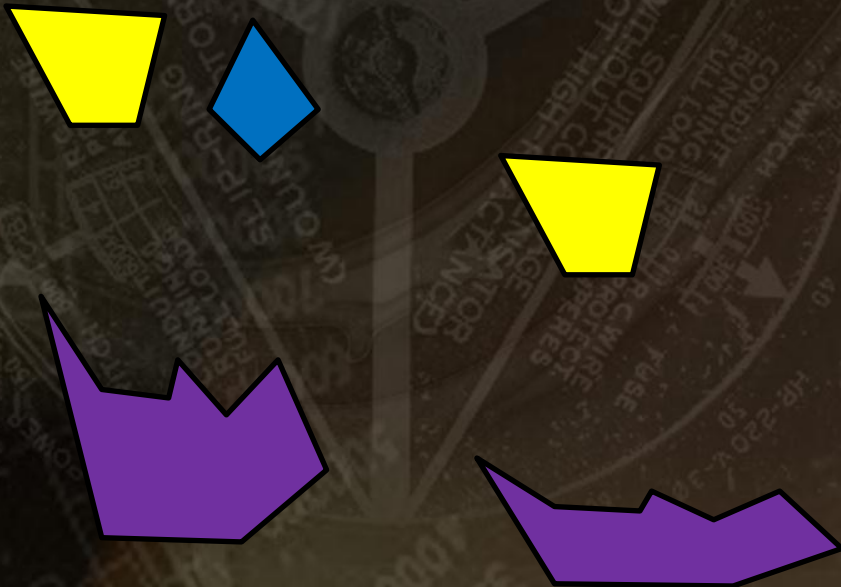
- **HIGH** temperatures cause enzymes to **denature** (unfold and lose shape)
- **LOW** temperatures slow molecules down and **less collisions**



Human
Enzymes:
35° - 40°C
(body temp
= 37°C)

Denaturing

- Denaturing: extreme temperature and pH can change enzyme shape, rendering it useless.

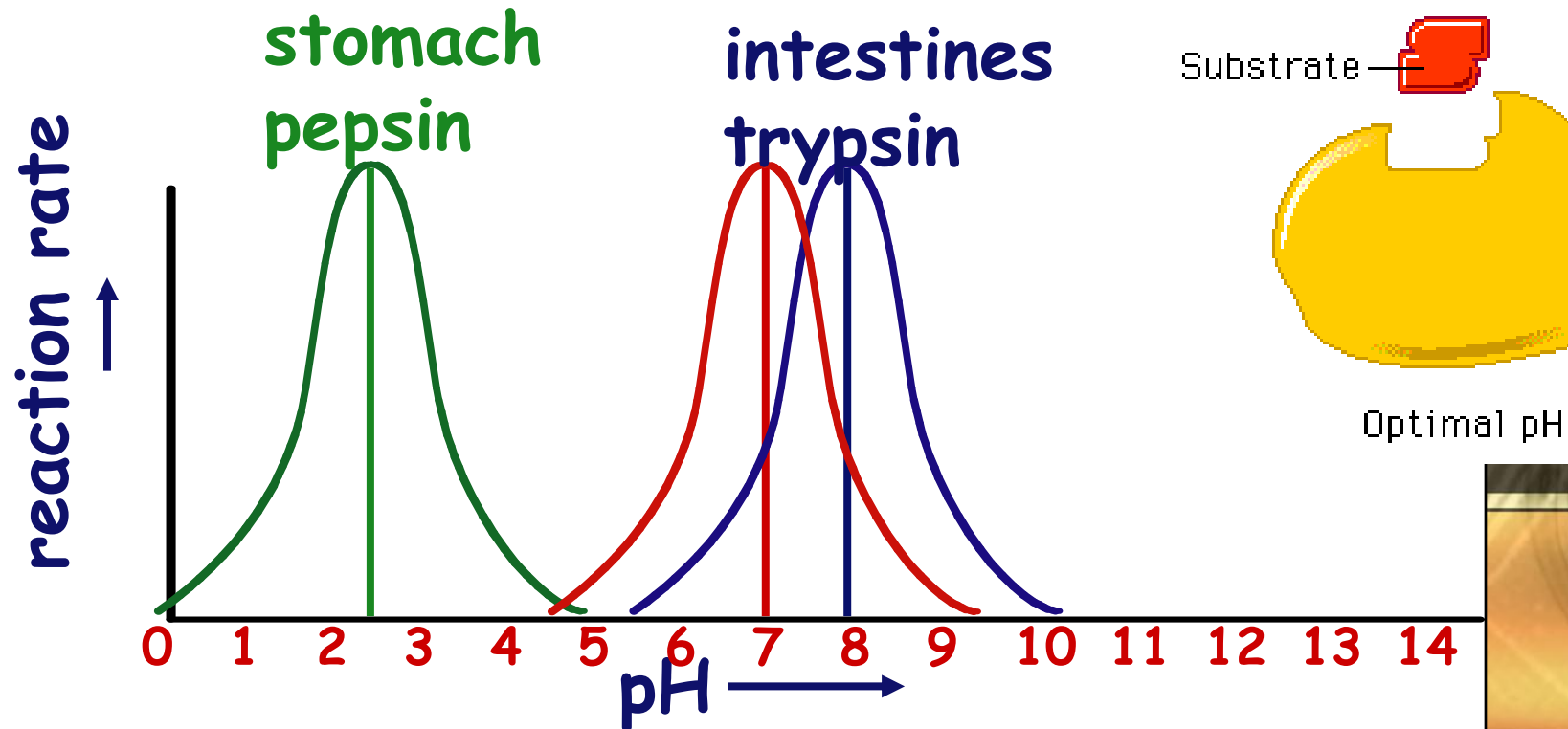


NORMAL SHAPE

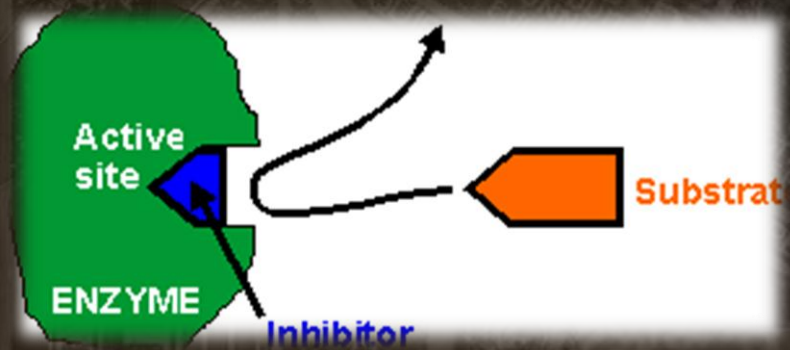
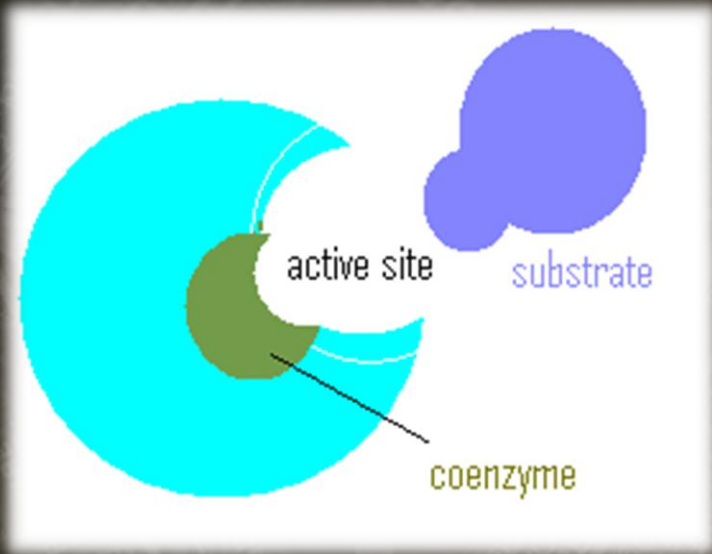
DENATURED SHAPE

pH

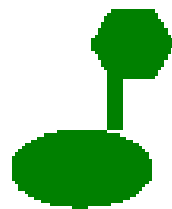
- changes in pH changes **protein shape**
- most human enzymes = pH 6-8
- depends on location in body



Cofactors, Coenzymes and Inhibitors



- **Coenzymes** are **needed** for the substrate to bind.
- **Inhibitors** **prevent** the substrate from binding.



Substrate



Product A



Product B



Active Site

Enzyme

Regulatory Site



Inhibitor

Every reaction in your body is helped by an enzyme.



Enzymes are the "workers" of your body.