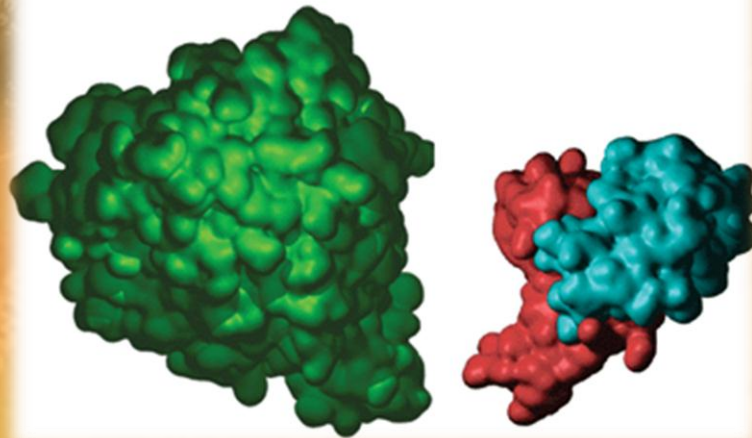


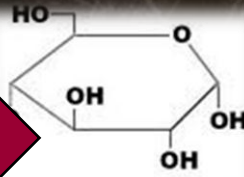
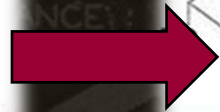
Enzymes

What happens to the food that we eat?



It breaks down into...

Carbohydrates

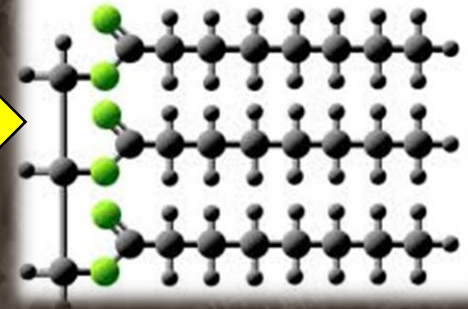


GLUCOSE

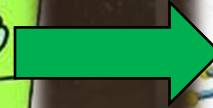
Lipids



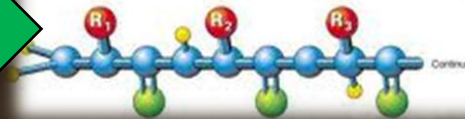
Triglyceride



Proteins

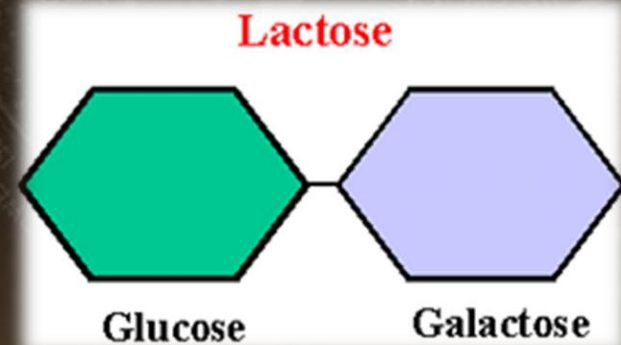


Amino Acid Chain (Protein)



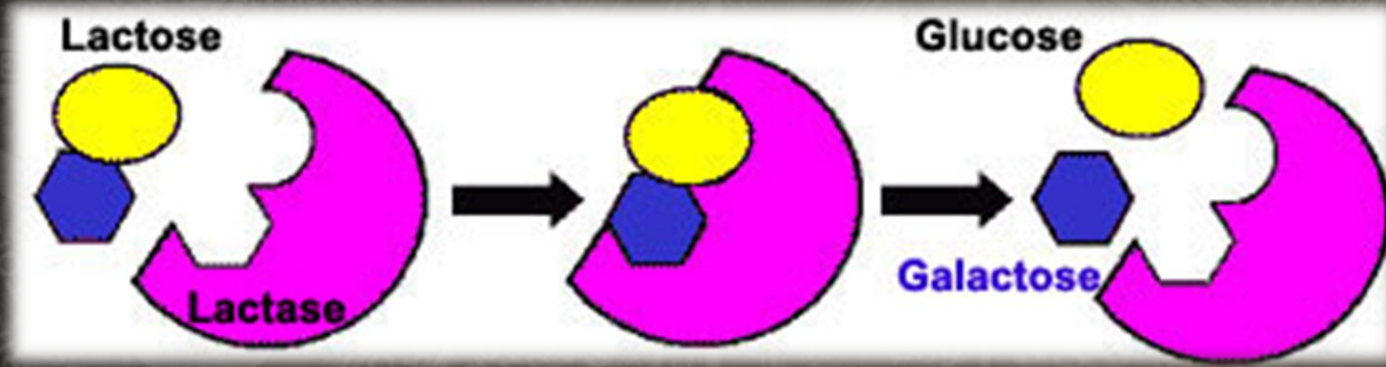
Let's look at... Lactose

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



What is Lactose-intolerance?

- They lack the enzyme: **LACTASE**

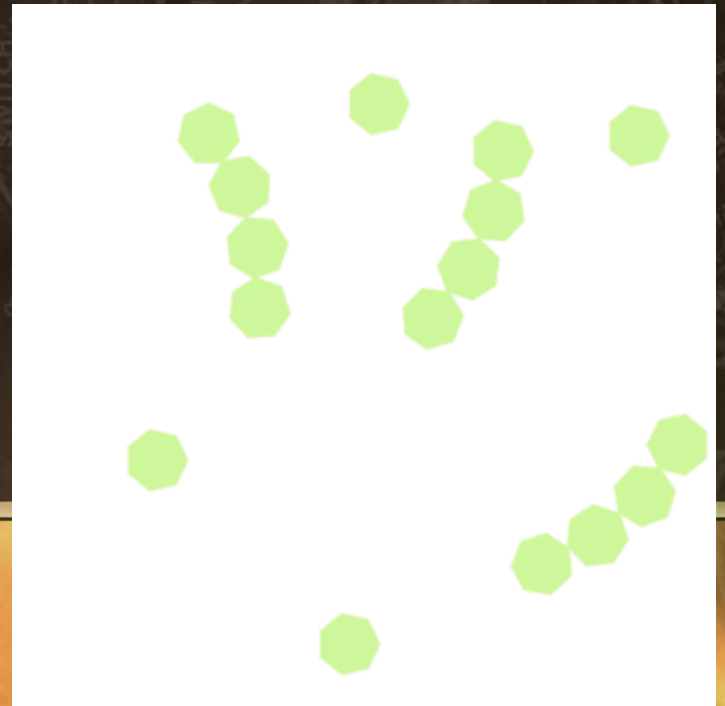
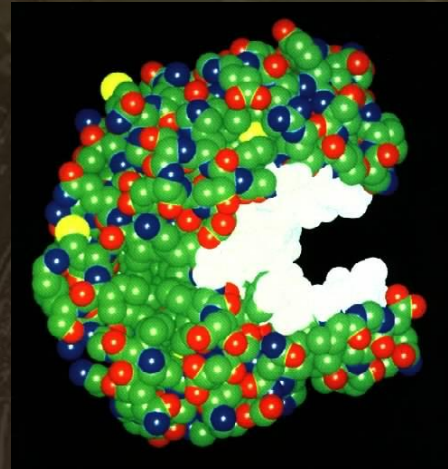


- **Sugars** end in "**-ose**"
- **Enzymes** end in "**-ase**"

But...what is an enzyme?

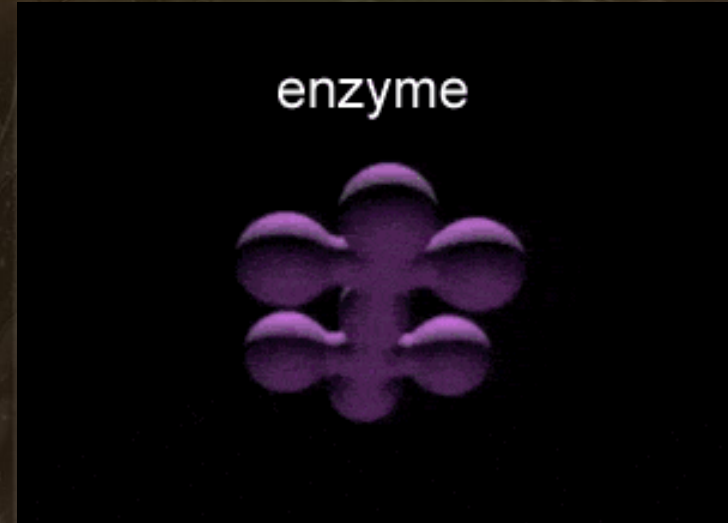
What Are Enzymes?

- 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

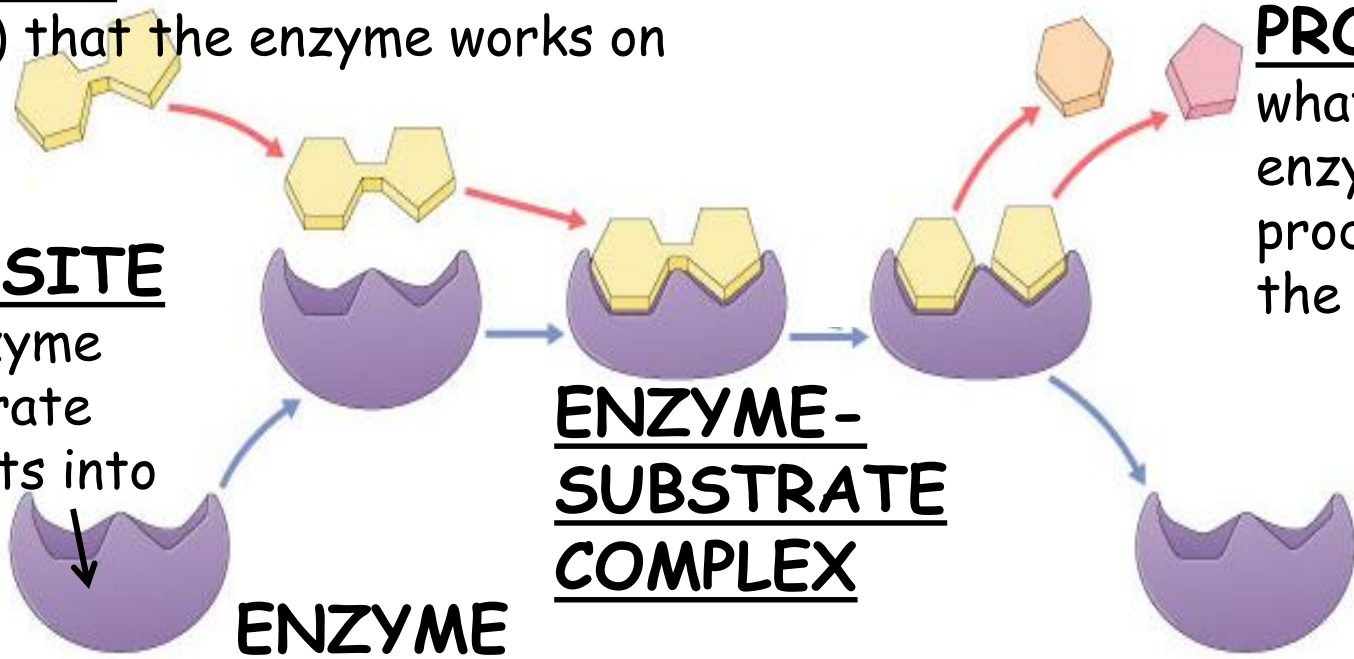
- **re-used** again for the same reaction with other molecules
- very little enzyme needed to help in **many reactions**

SUBSTRATE

Molecule(s) that the enzyme works on

ACTIVE SITE

part of enzyme that substrate molecule fits into



ENZYME

helper protein molecule

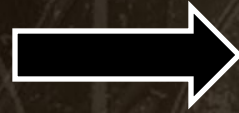
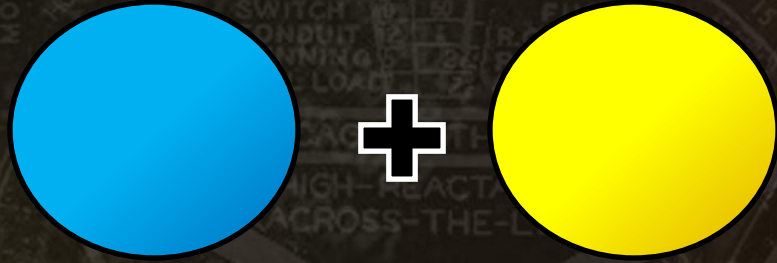
ENZYME-SUBSTRATE COMPLEX

PRODUCT

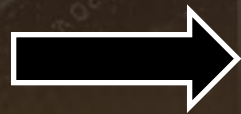
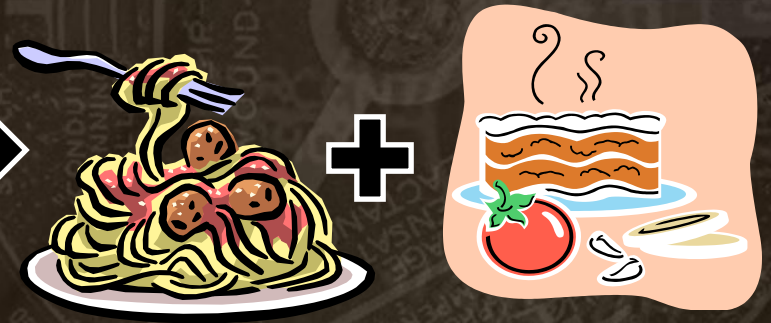
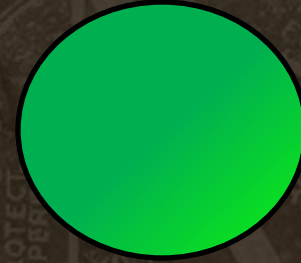
what the enzyme helps produce from the reaction

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

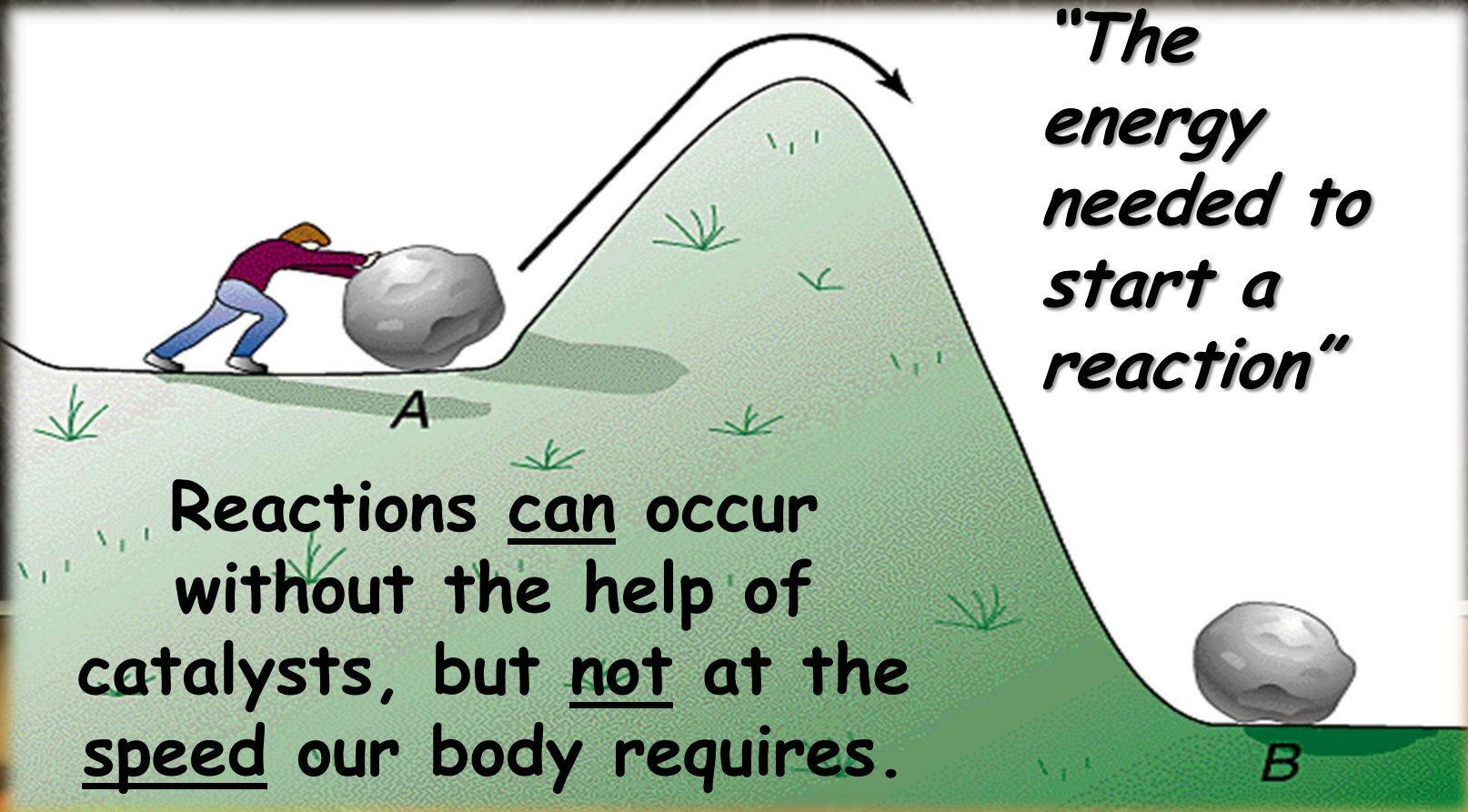
Chemical Reaction:

Enzyme + Substrate → Enzyme + Product
REACTANTS PRODUCTS



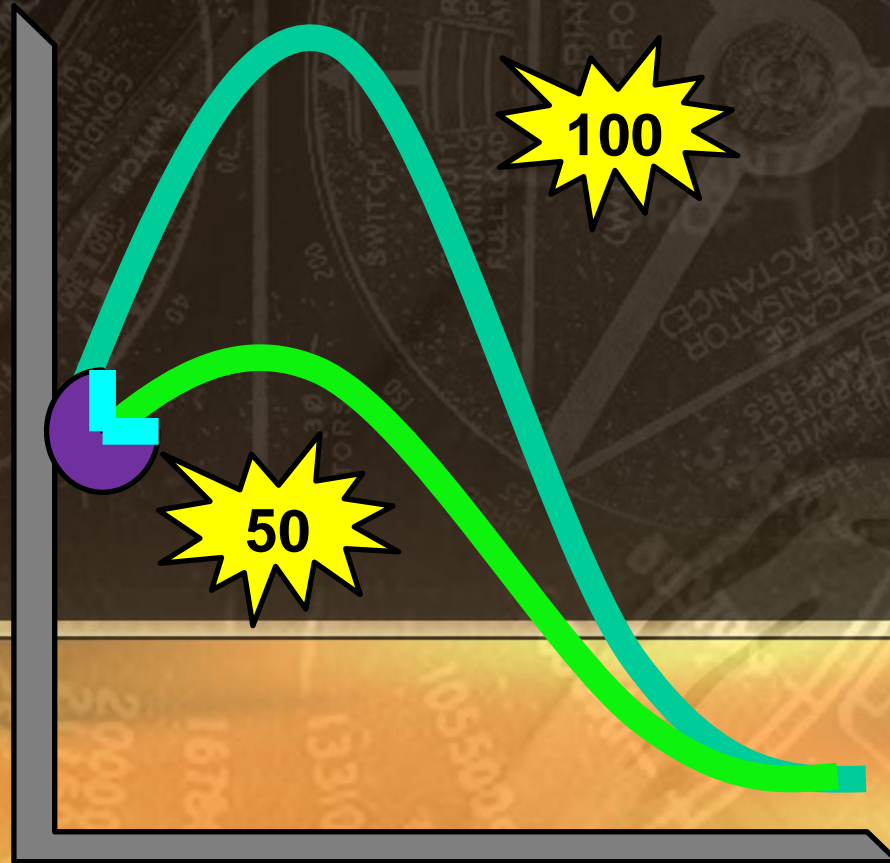
How do enzymes Work?

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

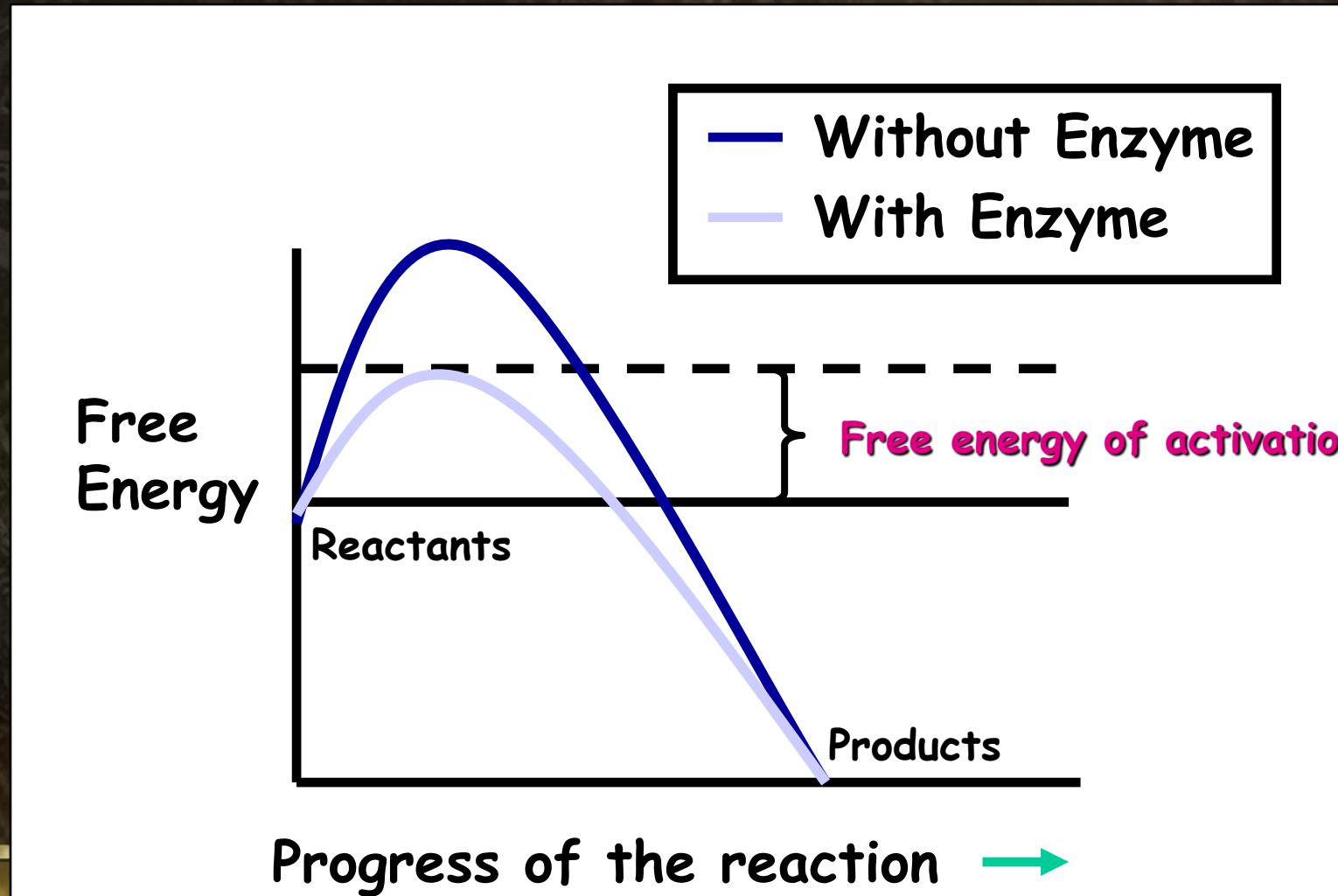


Activation Energy

- 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

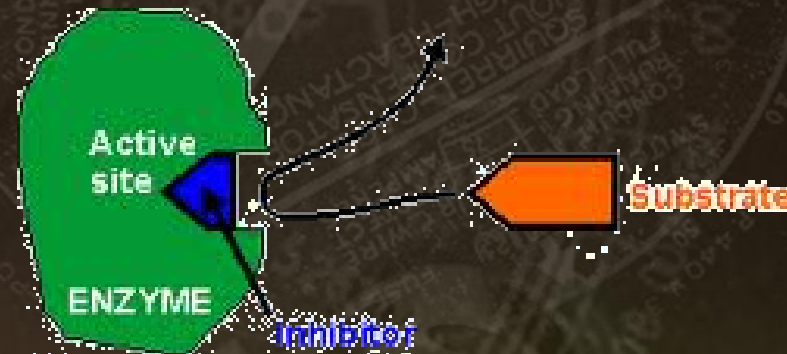
-pH, temperature, enzyme or substrate concentration

2. Cofactors and Coenzymes

-substances needed for the enzyme to work

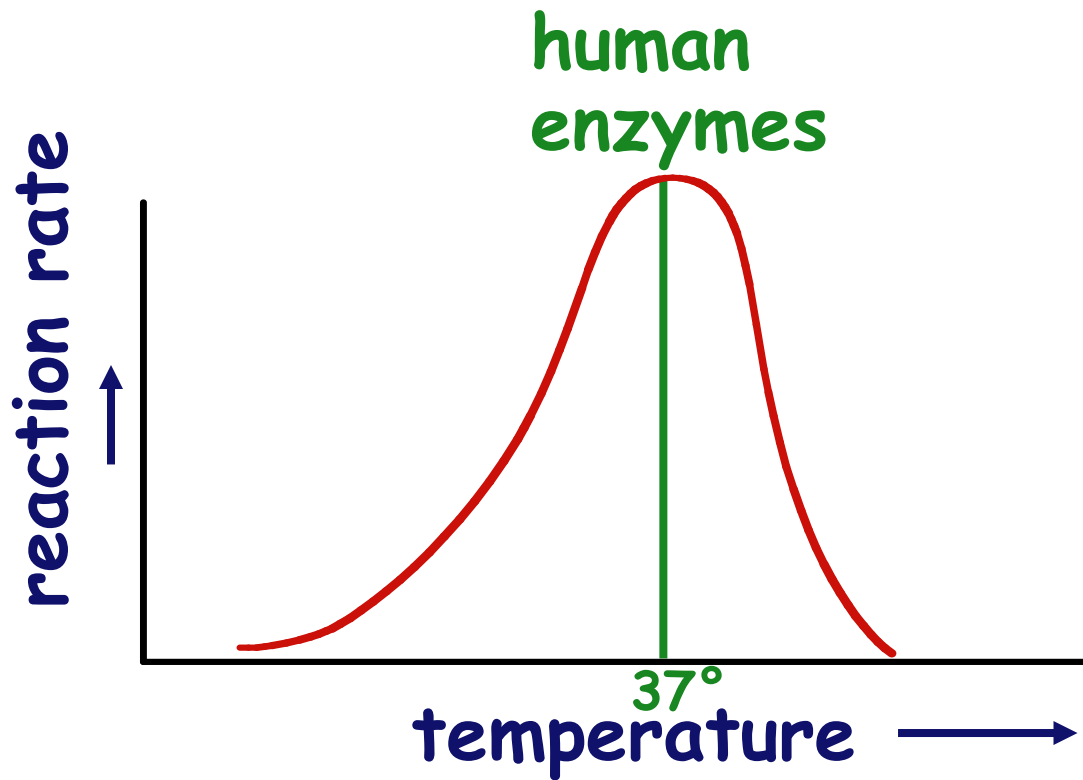
3. Enzyme Inhibitors

-bind and block the enzyme from working



Temperature

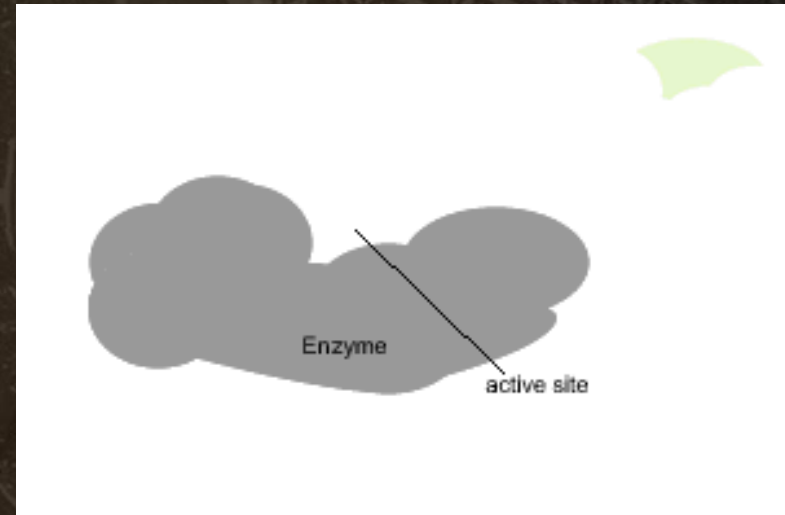
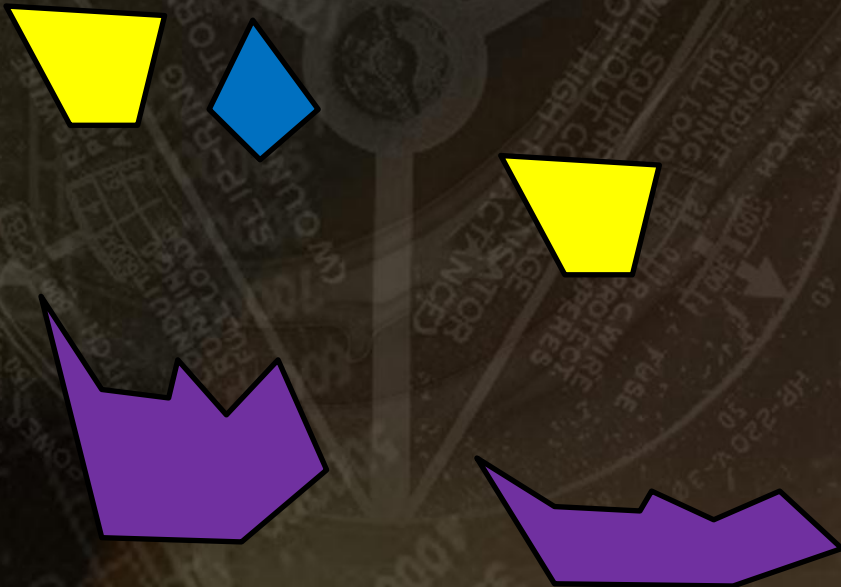
- **HIGH** temperatures cause enzymes to **denature** (unfold and lose shape)
- **LOW** temperatures slow molecules down and **less collisions**



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

Denaturing

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

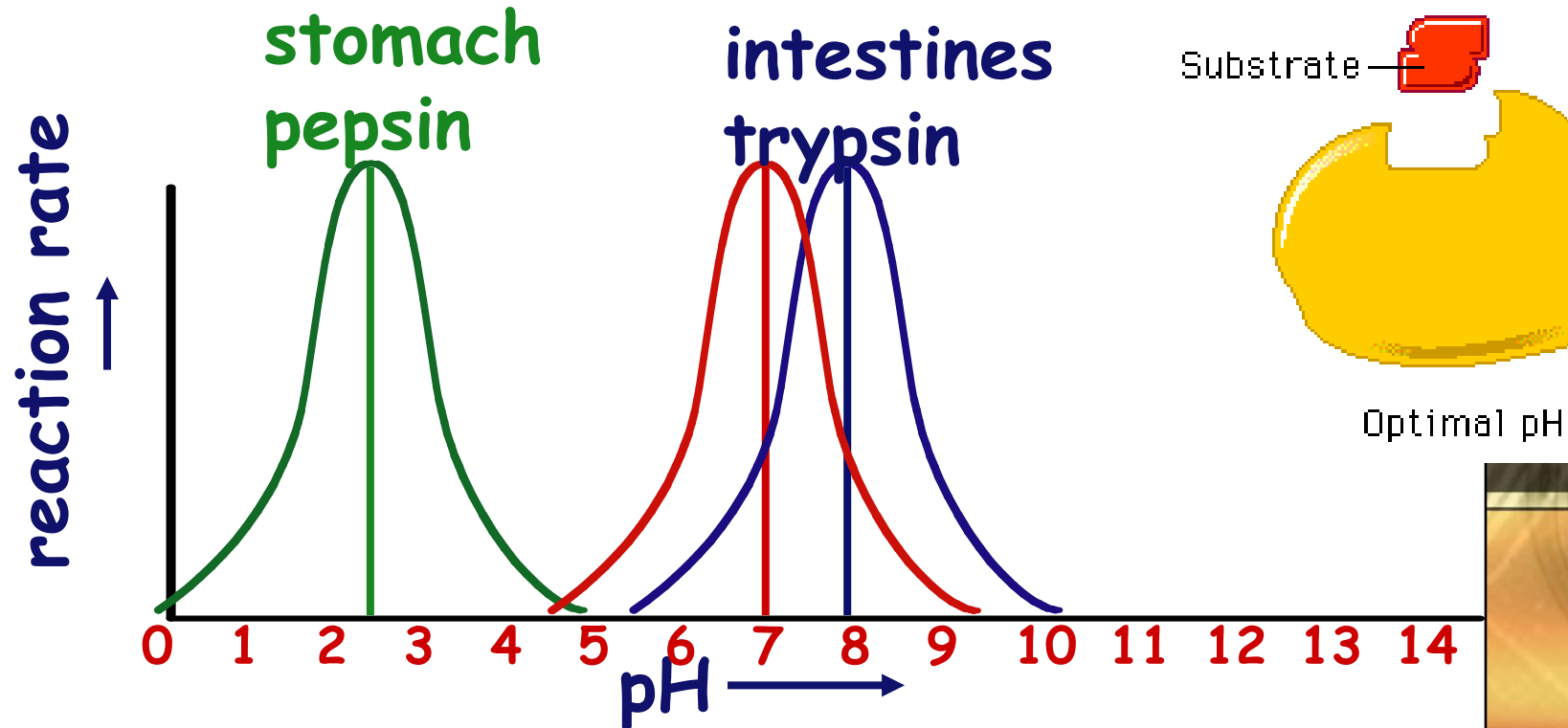


NORMAL SHAPE

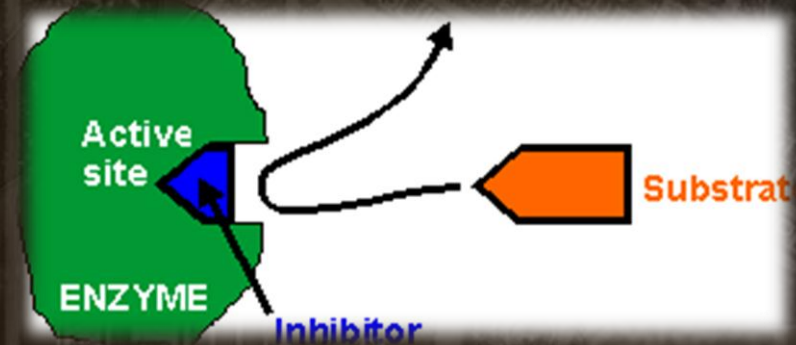
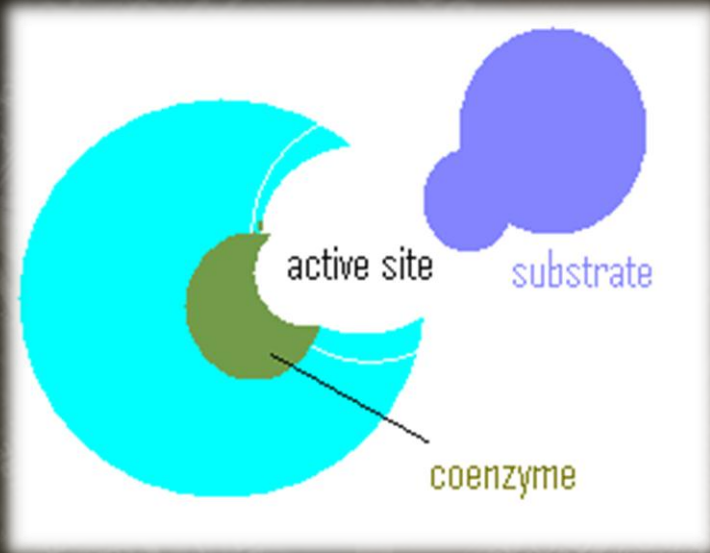
DENATURED SHAPE

pH

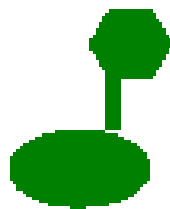
- changes in pH changes **protein shape**
- most human enzymes = pH 6-8
- depends on location in body



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.