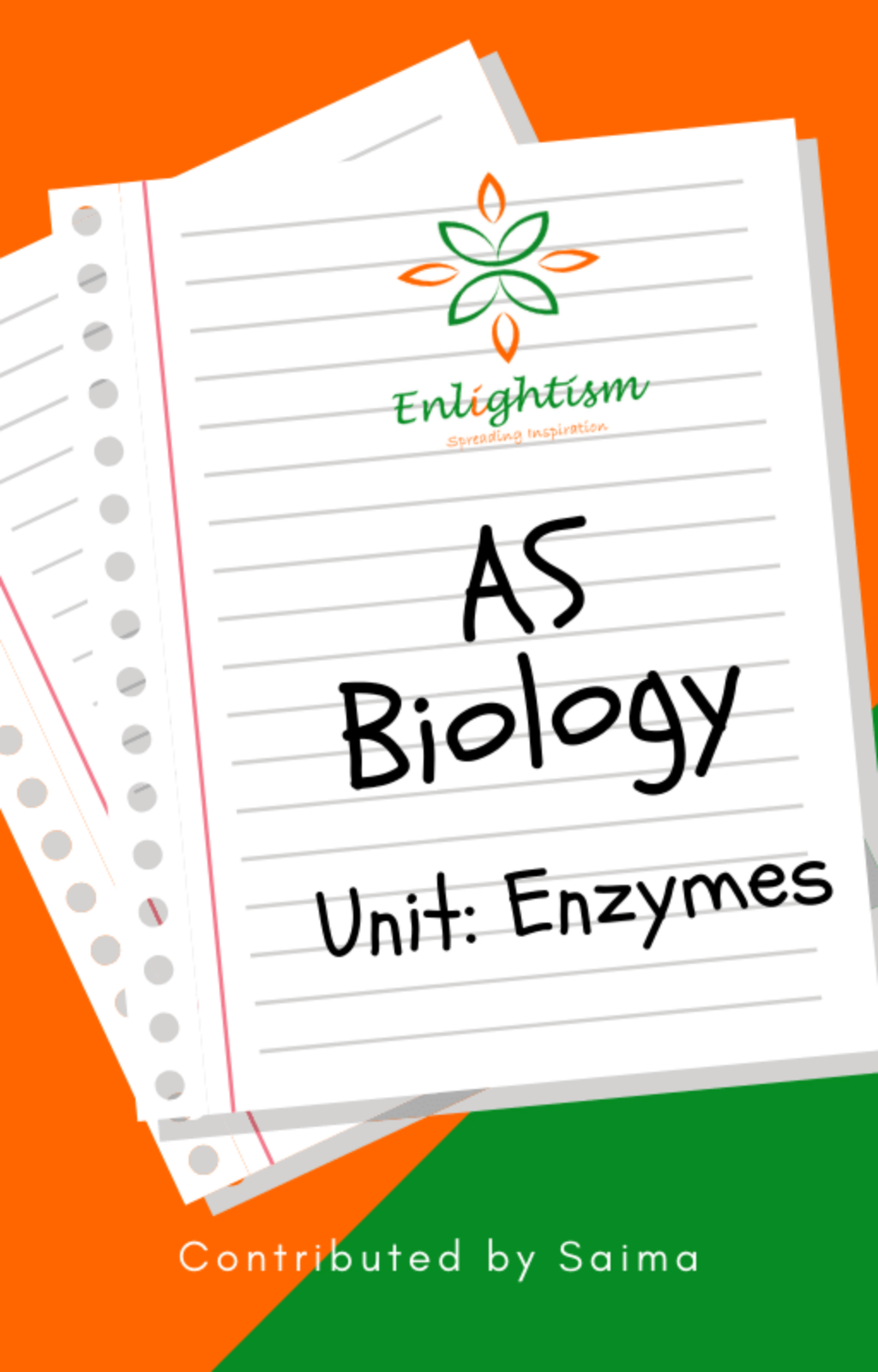

Enlightism
Spreading Inspiration
AS
Biology
Unit: Enzymes
Contributed by Saima

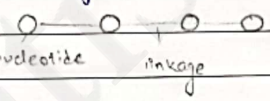
30th Oct'19 → 3 mcq's with graphs Wednesday

Ch # 4 ENZYMES

1 - They are protien in nature ↗ single polypeptide → 20 subunits / 20 monomers (diff)
Globular ↘ more than one polypeptide

2 - Biological catalysts ; work in living things

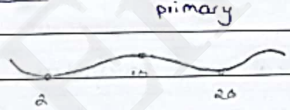
3 - few enzymes are composed of nucleotides (A, C, T, G, U)
↓
5 subunits / 5 monomers (diff)
(DNA has phosphodiester linkage & hydrogen bonding)

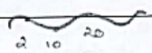


types :
DNAses , RNAses , nucleases
break DNA break RNA break both

4 - enzymes have active sites on their surface.
cluster of philic many active sites
A.A's

teritiary level
primary → Secondary





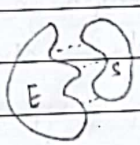
AA for apart AA come close

folding coiling & increases

teritiary

AA move close and cluster is formed

5 - enzymes bind with the substrate via active site



ionic or hydrogen bonds develop.
never disulphide
never peptide

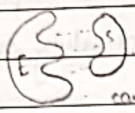
protien

Sajid

Valkyrie

y / Date

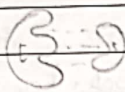
lmao! lmfao!



hydrogen bonds

carbohydrate

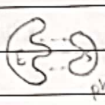
protien



lipids

hydrogen bonds

protien



hydrogen bonds

ionic with phosphate head

phospholipid

protien

6 - Enzymes can show synthesis as well as decomposition

7 - during reaction, they are not used up

8 - enzyme need help for their working (co-enzymes)

eg NAD in mitochondria, hydrogen carrier, captured

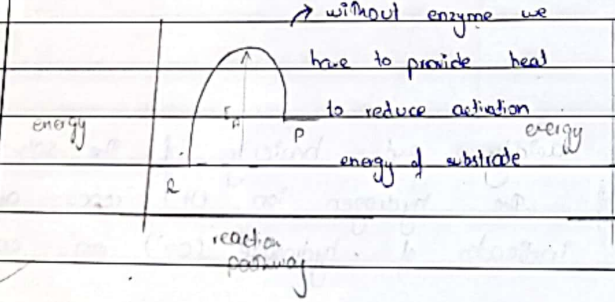
NAD is a dinucleotide NADH / red. NAD, give it on inner membr of mitochondria, return as NAD / oxidised NAD. H+ given to NAD dehydrogenase (enzyme).

9 - enzymes are specific, always work on a particular substrate

eg lipase, protease, amylase, cellulase

↓ lipids ↓ protien ↓ carbohydrate ↓ cellulose

Enzymes lower the E_a of a substance:



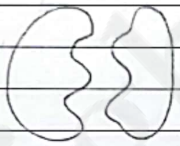
Saji

Day / Date

while binding with subtrate it provides electrons to substrate → causes bond breaking or making → product

Mechanism of enzyme action:

1. Enzyme binds with substrate via active site (specific) → ES complex → lock + key → induced fit
2. Hydrogen bond develops b/w enzyme active sites + substrate molecule
3. During binding enzyme active site transfers their electrons into the substrate
4. Transfer of e⁻'s reduces E_a of substrate
5. Bond making / breaking occurs within the substrate



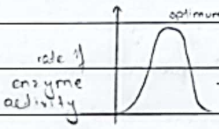
→ ES complex produced

6. Product leaves active sites
7. No effect on enzymes

effect of various factors on enzyme action

pH | temp | conc: of enzyme | conc: of substrate

- pH



- pH measures acidity and basicity of the solution. It is a measure of the hydrogen ion (H^+) conc: and therefore is a good indicator of hydroxide (OH^-) ion concn. It

Sajid

/ Date

ranges from a pH of 1 to 14, lower pH values mean higher H^+ conc: & lower OH^- conc:

- Acid solutions have pH lower than 7 and basic have pH values above 7. Deionised water pH is 7 which is termed neutral

- H^+ and OH^- ions are charged and therefore interfere with hydrogen and ionic bonds that hold together an enzyme, since they will be attracted or repelled by the charges created by the bonds. This interference causes a change in the shape of the enzyme and importantly, it's active site
- Different enzymes have different optimum pH values at which bonds within them are influenced by H^+ and OH^- ions in such a way that the shape of their active sites is the most complementary to the shape of their substrate
- Any change in pH above or below the optimum will cause a decrease in the rate of reactions, since more of the enzyme molecules will have active sites whose shapes are not (or atleast less) complementary to the shape of their substrate.

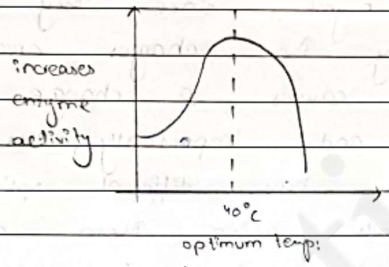
- **Temp.**

- increasing temp increases kinetic energy that causes effective collisions. This means that there are more random collisions b/w molecules
- since enzymes catalyses reaction by randomly colliding with substrate molecule, increasing temp: increases the rate of reaction, forming

Sajid

/ Date

- However, increasing temp: also increases the vibrational energy that molecules have specifically in this case enzyme molecules, which put strain on the bonds that hold them.
- As temperature increases, more bonds, especially the weaker hydrogen and ionic bonds, will break as a result of this strain on the bonds that hold them together.



- This change in shape means that the active site is less complementary to the shape of the substrate so that it is less likely to catalyse the reaction. Eventually, the enzyme will become denatured. This will decrease the rate of reaction
- As temp: increases, more enzymes molecules actives shape will be less complementary to the shape of their substrate and more enzymes will be denatured. This will decrease the rate of reaction.

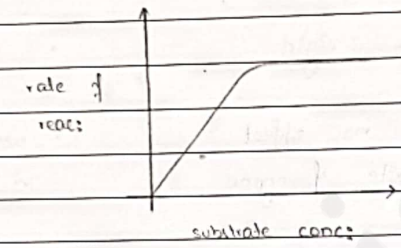
→ Substrate concentration:

- increasing substrate conc: increases ROR because more substrate molecules will be colliding with enzyme molecules so more products will be formed.

Sajid

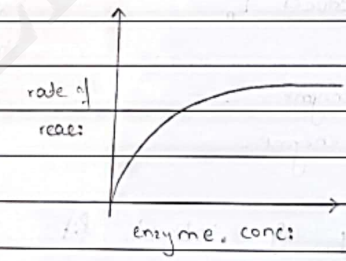
Day / Date

- However, after certain conc: , any increase will have no effect on ror since substrate conc: will no longer be a limiting factor. The enzymes will effectively become saturated and will be working at a maximum possible rate.



- Enzyme Concentration :

- increasing enzyme conc: will increase the rate of reaction as more enzymes will be colliding with substrate molecules
- however, this too will only have an effect up to a certain conc: as enzyme conc: is no longer the limiting factor

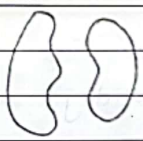


Sajid

Mode of action of enzyme

Specificity

lock & key	induced fit
enzyme specific rigid	specific
substrate has no effect on active site of enzyme	substrate induces changes in shape of A.S
slightly changed shape no E.S complex	E.S complex produced
	change has been induced by substrate
	the time product produced leaves
enzyme binds with substrate	
electrons transferred in AS	active site retain their shape (original shape)
transfer of e^- reduces E_a of substrate.	
without heat enzyme with heat no enzyme	



- Sim: b/w lock-key & induced fit
  - one type of substrate
  - both globular
  - retain shape / AS
  - AS's philic on the surface

Day / Date

differences b/w lock & key & induced fit

→ as does not change	- active site changes
→ rigid AoS	→ flexible AoS
- a particular substrate, no variations	→ small variations in substrate
smaller range	larger range
- no bond making or breaking on AoS	→ bond making & breakin on AoS

Inhibition

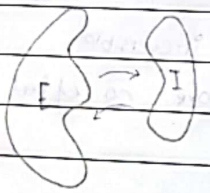
It is a chemical / substance which inhibits working of an enzyme

Types

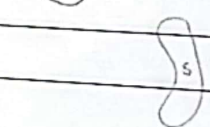
competetive | non-competetive

competetive

- → Binds with active sites
- → shape resembles substrate
- → competition with substrate for active sites
- → we increase conc: of substrate inhibitor leaves active sites
- → enzyme can work with substrate
- → type of reversible inhibition



enzyme affinity more for inhibitor than for substrate



Saji

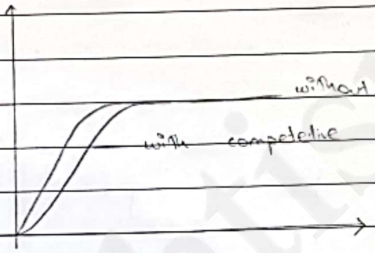
Hb + O_2 → affinity more in lungs

↓

however in respiring cell

↙ ↘

affinity for oxygen ↓ affinity for CO_2 ↑



↓

initially rate of reaction lower

↓

however increase in conc: of substrate

↓

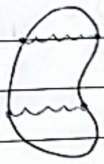
ROR moves to peak

inhibitor leave

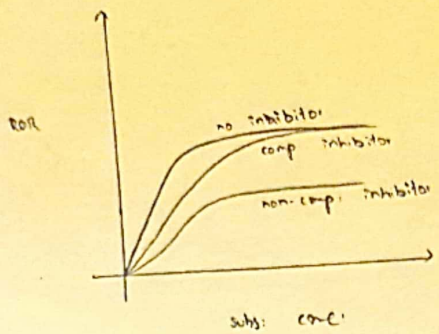
no chage in active site

non-competetive

- binds not on active site but on other than active site
- due to binding, chages occur within enzyme bond breaking & making
- chage ripples to active site
- active sites chage their shape
- A.s not availible to substrates
- type of non-comp: irreversible
- ↑ in conc: of sub: have no effect on As.
- As permanently changed



Sajid



⇒ diff b/w competitive & non-competitive

- competitive is always reversible non-comp is both
- comp: on ES, non-comp: on other side
- comp: shape same as subs:
- comp: does not damage bonds
- ↑ in subs:, comp. leaves

sim

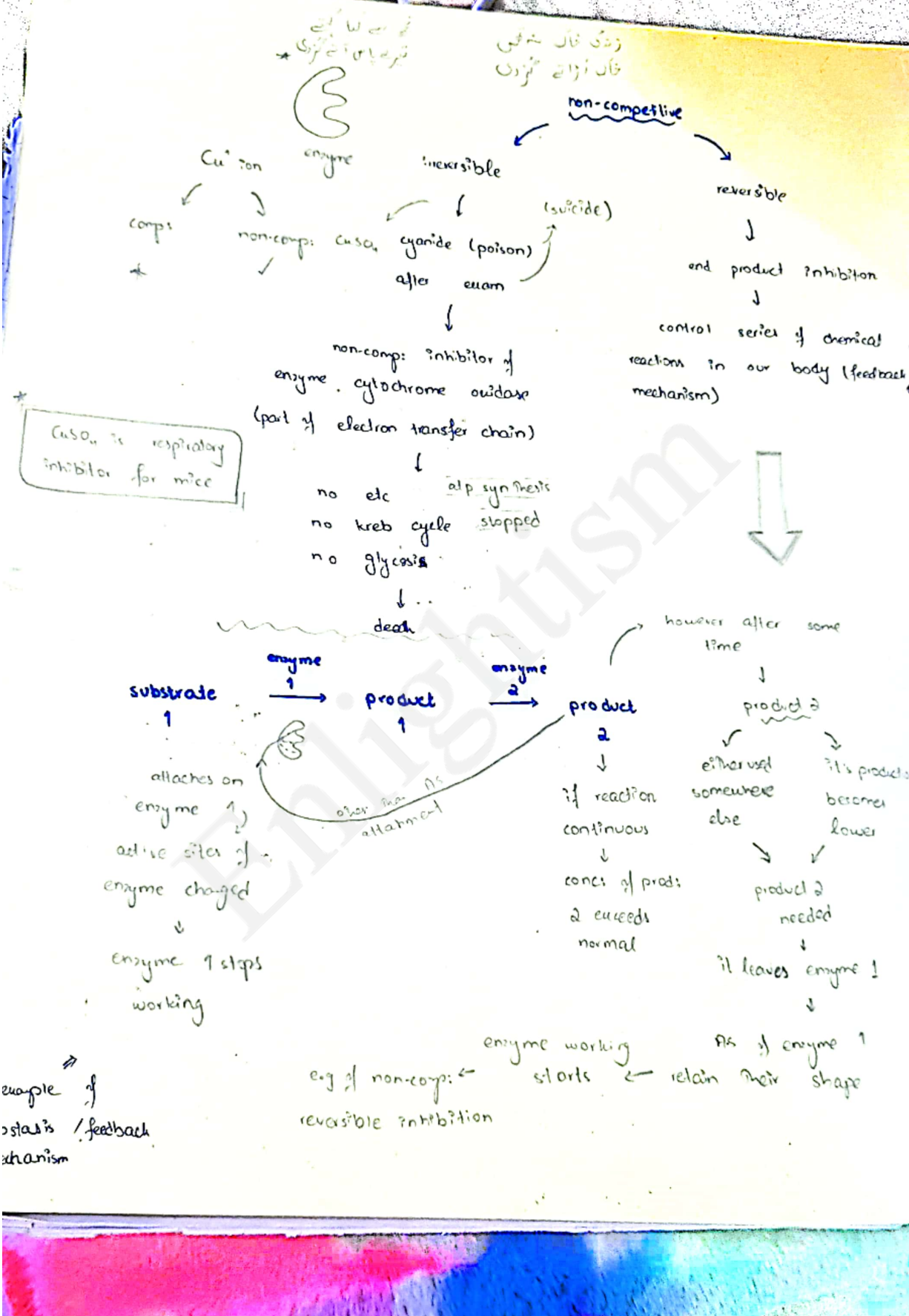
- work on enzyme
- initially lower ROR

example of comp:

A person drinks ethlene glycol (anti-freezing agent) accidentally. ? our liver small amounts of this chemical produced → however liver produces an enzyme → which converts ethlene glycol → oxalic acid. Kidney failure occurs while filtering oxalic acid. for treatment to prevent, we give alcohol to the patient.

alcohol (comp: inhibits) of enzyme → ethlene glycol → not converted into oxalic acid

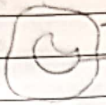
ethlene glycol level ↓ continuously checked ← The time all ethlene glycol excreted, alcohol consumption stopped.


non-competitive
reversible
end product inhibition
control series of chemical reactions in our body (feedback mechanism)
irreversible
(suicide)
cyanide (poison)
after enzam
non-comp: inhibitor of enzyme cytochrome oxidase
(part of electron transfer chain)
no etc
no krebs cycle
no glycosis
atp synthesis stopped
death
CuSO4 is respiratory inhibitor for mice
Cu+ ion
comp:
non-comp: CuSO4
enzyme
substrate 1
enzyme 1
product 1
enzyme 2
product 2
however after some time
product 2
either used somewhere else
it's product becomes lower
product 2 needed
it leaves enzyme
no of enzyme remain their shape
enzyme working starts
attaches on enzyme
active sites of enzyme changed
enzyme stops working
after that no attachment
if reaction continuous
concn of prod 2 exceeds normal
eg of non-comp: reversible inhibition
example of
stasis / feedback
chanism

Date

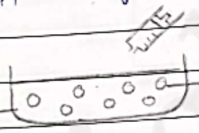
immobilization :-

"To encapsulate / cover an enzyme with an insoluble inert covering is called immobilization."



technique:

1. Add enzyme in Sodium Alginate
2. Transparent solut: produced, enzyme soluble in sod: alginate.
3. Take a beaker with $CaCl_2$ solⁿ. fill
4. filled solⁿ of Na alginate + enzyme in dropper / syringe



+

enzyme has been imm: in gel-like beads

$$\text{Na alginate (soluble)} + CaCl_2 \rightarrow \text{Ca: alginate (insoluble)} + NaCl$$

6th Nov '19 — wednesday

(i) example: making lactose free milk

↓ 2 methods

enzyme (directly) + milk ↓

enzyme immobility ↓ lactose + Na alginate

gel like beads

Saj

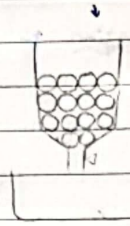
Day / Date

↓

disadvantag →

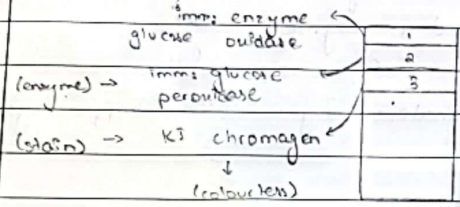
↙) people allagic to enzyme

contamination of milk expensive with enzyme



apparatus set on kitchen cabinet daily → lactose free milk obtained

② example: Clinistix → to find glucose levels in blood* / urine



Blood applied

↓

contains glucose

↓ (oxidation)

glucose → gluconic acid / glucono-lactose + H_2O_2

↳ enzyme 2 activate ← lowers pH

reacts H_2O_2 with KI chromagen → colour change → compare with table glucose level

adv. of immobilization: (beads)

↓ economical

↓ Recycling (can be used for months)

↓ no chance of contamination of enzyme

↓ temp & pH don't effect enzyme

Sajid

ate

↓

easy to handle (down streaming process)

H^+ / OH^- do not penetrate covering protects change in pH

↓

no effect on hydrogen bond / ionic bonds

normal as not affected. No change in disulphide / peptide bonds

disadv:

↓ time taking

↓ substrate take time to diffuse in, product takes time to diffuse out

↓ * ↓ if not properly washed out, contamination

↓ efficiency slower than free enzyme however can work for longer time

Contact Us For Queries Or Suggestions

Email us at: contact@enlightism.com

Follow Us At:
@enlightism

ENLIGHTISM.COM