Chapter 8 :- metapolism (chemical and energy transportation to cells)

anapolism (building)
simple → complex
ATP
eg:- photosynthisis

catapolism
complex → simple
ATP

* simple = H_2O / CO_2
* complex = Glucose

* Energy :- ability to do work. (Free energy) = G
(can't be created, can't be destroyed, but can be transform)

eg:- of energy :-
chemical / electrical / heat / light

From → loss = disorder = Entropy (is increasing) → to

* chemical transformation :-

high G ↑ A+B → C+D G ↓ low ⇒ 1] Exergonic reaction
reactant products
A) $\Delta G = (-)$
B) spontaneous
e
(different in energy is released)

2] G ↓ A+B → C+D ↑ G ⇒ 2] Endergonic reaction
e
A) $\Delta G = (+)$
B) non-spontaneous

3] A+B ⇌ C+D
G = G
3] equillibrium A) $\Delta G = 0$ b) reversable (not in living system)

* Most of cell reactions are endergonic which need energy From =>
1] environment 2] exergonic reactions

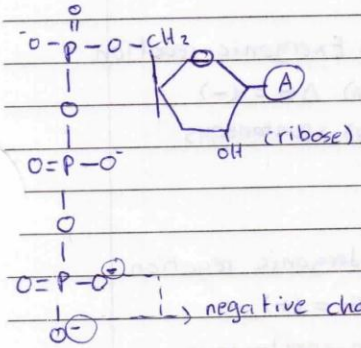
* Endergonic ⟶ Exergonic } = coupling
ATP

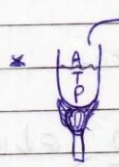
* A ⟶ P ... => A →(E) B →(E) C ⟶ P
chemical pathway

B, C => intermediate

* ATP = Adenosin Tri phosphate (P)
* GTP = Guasin Tri phosphate

* ATP :-



* 

hydrolysis

negative charge = high energy = unstable = active

ATP + water ⟶ ADP + 7.3 Kcal + (P)

ADP + 7.3 Kcal + (P) ⟶ ATP => Phosphorylation

(A) + ATP → (A)–P phosphorylation

* requairment For chemical reactions :-

1] reactants must be very close to each other.
2] correct orientation
3] transition state :-

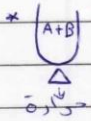
reactant → products

bonds must be broken — new bonds should be Formed

* after breaking old bonds and before Forming new bonds = "Transition state"

4] starter energy = energy of activation (E_A) even if it was exergonic. / it helps to break bonds and enter the transition state

* التفاعلات قد تحتاج طاقة عالية جدًا فنستخدم catalyst لتسريع التفاعل لتخفيف Ea

* 

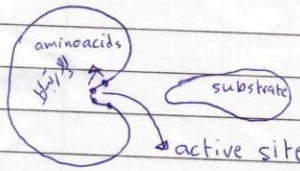
بعض التفاعلات تحتاج حرارة ونضغط

* The cells use biological catalyst. => Enzymes

* Enzymes → most are proteins / RNA (Few) => ribozymes

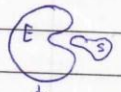
* sucrase (enzyme) + sucrose (substrate) → urease → urea

*every enzyme has specific substrate because it has active site only Fits for one substrate.



Enzyme
(has confirmation)

(E) + Enzyme + substrate (S)
↓
Enzyme substrate complex
↓
product + enzyme



confirmation → after binding of the substrate a change in confirmation accurs (catch the (S) very well)

 => induced Fit

*enzyme Functions:-

1] induced Fit

2] work as template => approch in correct orientation

3] suitable pH => (micro suitable environment)

acid	base
the amino acid in active site is acidic	the amino acid in active site is basic

4] chemical groups (direct participation in reactions)

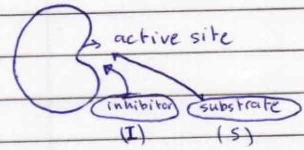
* Enzymes need specific conditions → pH
best activity → Temprature

* pH for pepsin in stomach => 2 acidic
" " tripsin in intestine => 8 base

* some enzymes are active when they are produced, others are not.

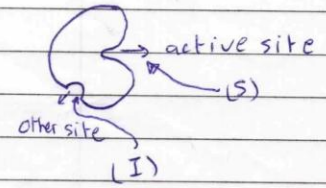
* enzymes are regulated (can be switch on/OFF)
on → activation
OFF → inhibition
inhibition by inhibitors
inhibitors → reversible ⇐ by weak bonds, eg: ionic, H-bond
inhibitors → irreversible ⇒ by strong bond, eg: covalent

* reversible inhibition :-
i] compatitive (the inhibitor connects to the active site)



يحصل تنافس بينهم للدخول إلى
active site.
[I] > [S] => I connects to the active site with weak bonds => The enzyme will stop working.
* ليرتبط (S) نزيد تركيزه ليصبح أكبر من (I).
*

2] non-compatitive :-



(I) connects to the other site by weak bond => change in confirmation of active site => enzyme won't work

* إذا حطينا الروابط الضعيفة يعود الإنزيم نشيط

* irreversible => same as non-compatitive but the different is that bonds are stronger so the the conFermation won't come back.

مثل الكثيرات يوقف إنزيمات معينة بالكثيرات نفسها : eg

* Plz refere to the book or slides to study (Allostration, cooprative regulation and feed back inhibition), Sorry but theg contain many pictures :C