الآمال

مادة Bio1

للطالبة المبدعة

سالي مسلم

شرح مفصل للمادة

مضاف اليها اسئلة سنوات سابقة

مادة الفيرست

Chapter 4

Carbon: The basis of molecular diversity.

Molecules : جزيئات
Atom : ذرة
Formation : تكوين
Organic : عضوية
Shell : قشرة
Valence : تكافؤ
Covelent bound : رابطة تساهمية
Variation : تنوع
Skeleton : هيكل
Branched : متفرّع
Isomers : ذظائر / متماوغان
Structural : بنائية
Enantiomer : بصرية
Cis-trans isomer : متماوغات هندسية
asymmetric : غير متماثل
Symmetric : متماثل
Hydrophobic : كاره للماء
Hydrophilic : يحب الماء
Predominate : سائدة / منتشر
Decrease : نقصان
In Crease : زيادة
Backbone : الأساس

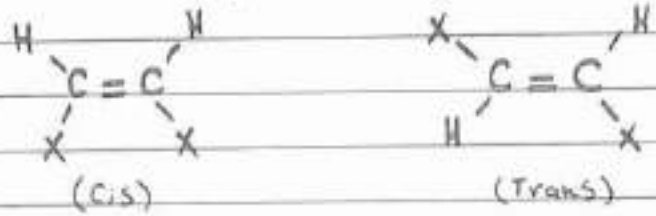
- Carbon the most important atom on earth.
- Carbon the backbone of life.
- It is
- It is responsible for formation of organic compounds, why?
  ⇒ It is tetravalent, have 4 e⁻
  So, it can share with any atom.
- Carbon can bond to itself to resulting in formation of C-chain OR C-skeleton.
- Simplest organic compound that contain C and H "HydroCarbon"
- Carbon can make organic compound variety of :-
  1) Length. 2) Form (Shape). 3) Number and Location of double bond.

Linear "open chain" Ring "cyclic" Branched.

Isomers :-
organic compound that have the same molecular formula But, differ in structural formula.
There are 3-type of isomer:-
1). Structural.
2). Cis-trans.
3). Enantiomer.

* Structural isomer :-
isomer vary in Location of Covalent bond.

* Cis-trans isomer :-
Geometric isomer differ in arrangment about double bond.



* Enantiomers :-
That vary in Spatial arrangment around an asymmetric Carbon; resulting in molecule that are mirror image.

asymmetric :
- الروابط اللي حوالينها كلها Single bond.
- different Covalent atom.

There are 2-type of enantiomer :-
1) L-enantiomer. "يسار"
2) D-enantiomer. "يمين"

سؤال الامتحان :-
Which of the following asymmetric ?!

Functional group :-
Chemical group are directly involved in chemical reaction.

There are 7- functional group :-

1). Hydrocarbon :
- Carbon and hydrogen.
- Non-Polar.
- Hydrophobic. "heat water"
- Water insoluble.

2). Hydroxyl group :
- R-OH.
- Polar. "hydrophilic"
- Found in suger. Example :- Ethanol
- responsible for alcohol Compound.
- Name Compound : Alcohol.

3). Carbonyl group : O
- R-C-H OR R-C-R
- Polar.
- responsible for formation aldehyde and keton.
- Hydrophilic.
- responsible for formation suger.
- Predominante in suger.
  Suger + keton → ketoses.
  Suger + Aldehyde → Aldoses.

4). Carboxyl group : O
- RCOOH OR R-C-OH
- Polar. "hydrophilic".
- Charged (-1)
- Act as weak acid.
- Lower pH.
- predominant in Amino Acid.

5). Amino group :

- $R-NH_2$.
- polar, Also charged (+1)
- Act as a weak base .
- increase pH.
- responsible for formation of Amines.
- predominate in Amino Acid.

6). Phosphate group :

- $R-O-\overset{\overset{O}{\|}}{\underset{\underset{OH}{|}}{P}}-OH$
- polar . "hydrophilic".
- Act as weak acid.
- decrease pH.
- responsible for organic phosphates.
- predominant in ATP (high-energy-compound)

7). Sulfhydryl group :

- $R-SH$.
- polar . "hydrophilic".
- responsible for formation thiols.
- predominant in cystein Amino Acid.

Problem :-

1. Organic chemistry is the study of Carbon Compound ?!

2. Carbon atoms Can form diverse Molecules of bounding to 4 atom other ?!

3. Carbon responsible for formation of organic Compound ?!

4. Carbon atoms the backbone of life ?!

5. Simplest organic Compounds that Called _____ .!

6. Carbon Can make organic Compound that vary in form . remember then ?!

7. Orgainic Compound that have the Same molecular formula But differ in structural formula is Called _____ .

8. Isomers that Vary in Space arrangment of Covelent atoms around C = C is _____ .

9. That vary in spatial of Covalent atom around Symmetric Carbon is _____ .

10. Two type of Enantiomers :

a) _____

b) _____ .

← أي سؤال عن هيدل بجي عليّل (دوائر) . ♡

The End...

Biological Maeromylcules and lipid cHapter 5

Biological Mulcule :- organic mulcule of living organism.

- Large (macrow) ≥ 100000 dalton
- Small (micro) < 1000 dalton

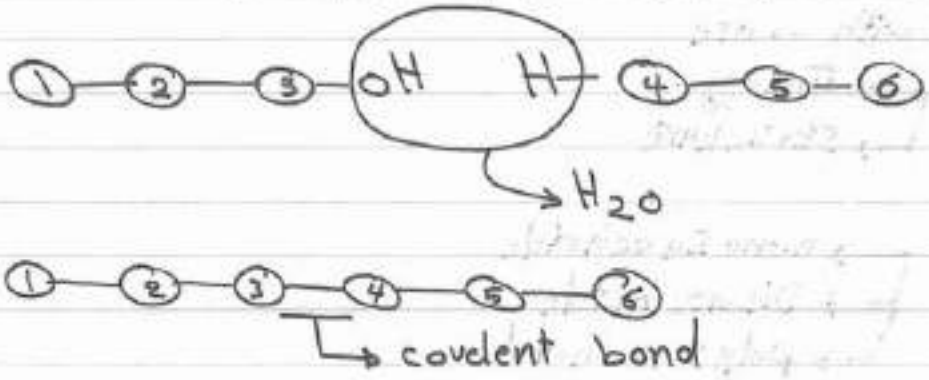
→ Macromulcule are polymers

polymer : Long molcules consisting of many similar or identical building blocks linked by covelent bond.

* polymer made of small repeated building units called monomers.

monomer :- small repeating unit that serve as the building block of polymers.

The synthsis of polymer :
(dehydration reaction) → monomer are connected by reaction in which two molcule are covelent bond each other, with the loss of H_2O molecule

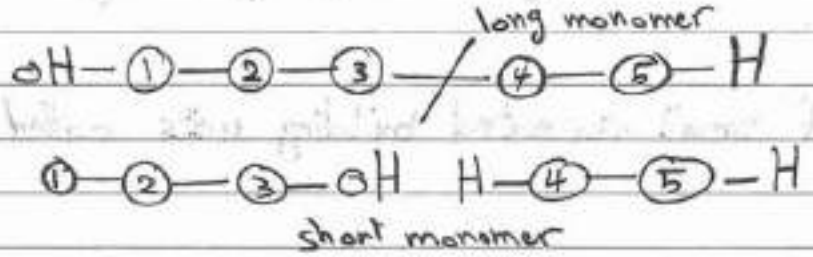


* إلي ال ـ اذا بدي أعرف عدد الـ covelent bond أو جزيئات H_2O

No of monomer − 1 = ___

- How many molcules of water are need to completely hydrolyze apolymer that is 10 monomer Long ?

breaking of polymer
- by Hydrolysis reaction → the bond between monomer is broken by addition of water molcule.



* biological molecules 4 classes
  - → carbohydrates
  - → proteins
  - → Nuclic acid
  - → lipids

  } polymers (macro molcule)

→ Carbohydrates (CH_2O) → $(C_nH_{2n}O_n)$
- Name ends with — ose
- Function → Energy
  - → structure

- 3 groups
  - → monosacchride
  - → Disacchride
  - → polysacchride

- carbohydrate macromolules are polymers called polysacchride
- The simplest carbohydrate are the monosacchrides.

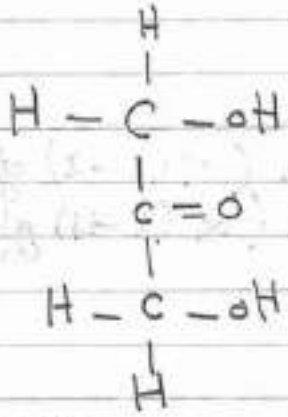
1 Monosacchride :

- The most common monosacchride (Glucose ($C_6H_{12}O_6$))
- The simplest monosaccrides (Trioses) $n=3$

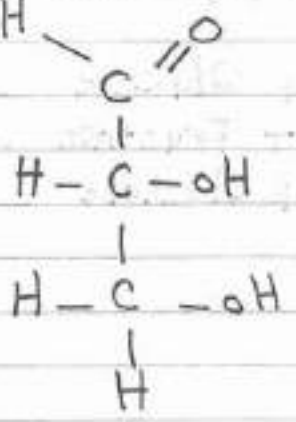
mono are highly Diverse
- They vary length
- They vary C=O → aldose or ketose
- They vary in form
  - → linear
  - → cyclic (ring)
    - → α alpha
    - → β Beta

$n=3$ → Trioses
$n=5$ → pentoses
$n=6$ → Hexoses

(Ketose) OR (Aldose) لدي نوعين من السكر
بالاعتماد على موقع (Location) الـ carbonel group



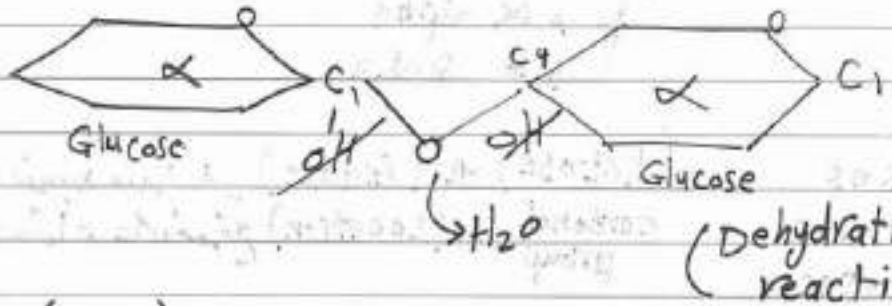
Dihydroxy acetone



Glycer aldyde

	aldose	ketose
Trioses $C_3H_6O_3$	Glyceraldhyde	Dihydroxyacetone
pentose $C_5H_{10}O_5$	ribose (RNA)	Ribulose
Hexoses	Glucose	Fructose

2 Disacchrides → two monoTained by glycosidic Linkege
→ 3 Example (maltose, sucrose, Lactose).



→ ∝ (1-4) glycosidic linkage.

Glucose + Glucose → maltose
Glucose + Fructose → sucrose (∝ (1-2) glycosidic linkage)
Glucose + Glactose → Lactose (∝ (1-4) glycosidic linkage)

[3] Polysaccharides → several mono by many glycosidic linkages.

↳ 2 type of poly according to function.
a - Storge
b - structural

A. Storge poly (energy storage)
↳ starch
↳ glycogen

→ starch (energe storge poly in plant).
↳ monomers → glucose.

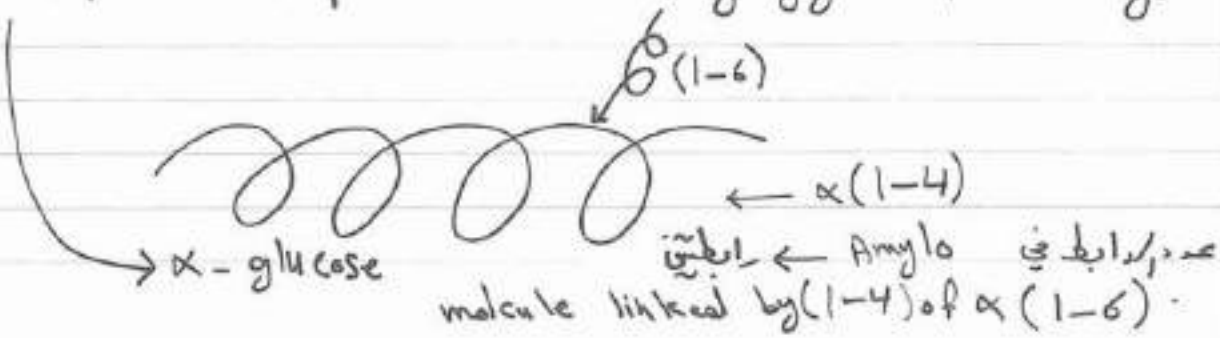
→ plastids (chloroplasts)

2 Example (Aylose and Amylopectin).

* Amylose ⇒ helical, unbranched, the simplest form of starch → amylose.
→ α(1-4) glycosidic linkages.

* Amylopectin ⇒ a more complex starch, branched, helical

→ α(1-6) at point of branching glycosidin linkage



→ Glycogene
  ↳ energy storge poly in animal
    ↳ liver cell.
    ↳ muscle cell.
  ↳ Similar to Amylopectin but more branched.

B- structural.
  ↳ cellulose and chitin.

→ cellulse → mage structure in plant cell wall.
  → linear, unbranched.
  → can form fibres.
  → is made of β-glucose linkage β(1-4)
    ↳ made cellulose indigestible except Fungi and Bacteria.

→ chitin (structural poly in exoskeleton of insectes and cell wall of fungi) الكيتين

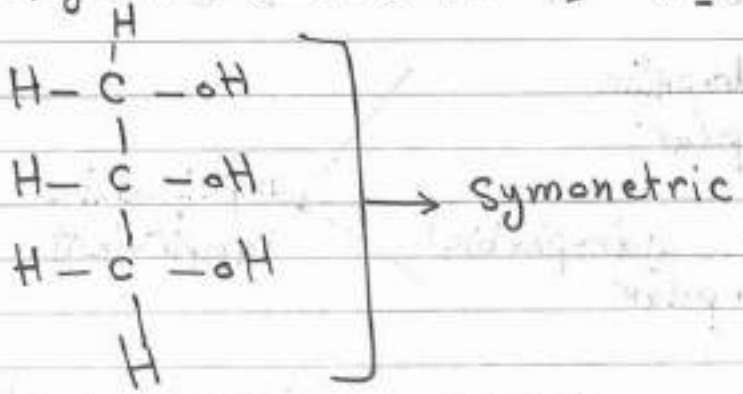
→ β (1-4) glycosidic linkage mad chitin indigestible except Fungi and Bacteria.

⇒ lipids :
1. non-polar
2. Hydrophobic
3. not macromolecules
4. not polymers

3) types → Fats
→ phospholipids.
→ steroids.

→ Fat → Triglycerids OR Triglycerols.
Fat molecule = glycerol + 3 Fatty acids
Linkage by 3 covelent bond (ester linkage).

Glyserol ($C_3H_8O_3$) كحول وليس سكر



→ Symonetric

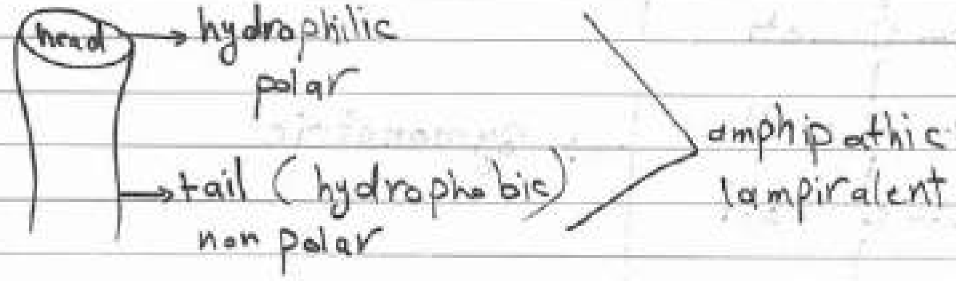
* Functions of fats :-
1- storage energy.
2- Shock absorption → امتصاص الصدمات لحماية بعض الأعضاء الحيوية
3- Insulation → تحول حراري

Fatty acids :- long hydrocarbon chain (16 - 22) C
that end with COOH

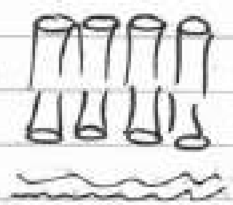
- general formal RCOOH , $R-\overset{O}{\overset{\|}{C}}-OH$

saturated (مشبع)	unsaturated (غير مشبع)
1. No double bond	1. No double bond
2. long chain.	2. Short chain
3. Solid at room T	3. liquid at room T
4. in Animal	4. in plant
5. less helathy.	5. more healthy.
6. better زبدة	6. vegtables oil.

X phospho lipid = glycerol + 2 FA + P group



phospholipid اذا كانت ال
2layers of في طبقتين تكون
phospholipid bilyars طبقة ثنائية

⇒  become phospholipid are amphipathic.

↳ phospholipid bilayers
(in the center) tails
(out side) heads

Function :- formation or structural of cell plasma membrane.

→ steroids.
* Lipid made of 4 fused rings.
* most important steroid in cholestrol
* structural of animal cell plasma membrane.
* precurs for synthsis of other steroids (sex hormon).
→ functions cholestrol.
* cholestrol is synthesized in the Liver.

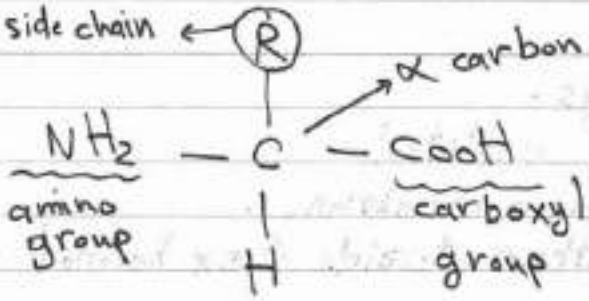
→ proteins.
biologycally Functional molecule made up one or more polypeptid chain.

polypeptid chain → several Amino acids linkage by several covelent bond called peptide linkage.

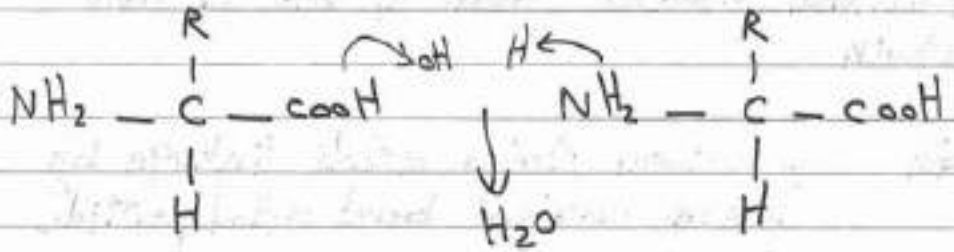
* polymer of amino acids is polypeptide.
↳ a.a.

* Functions of proteins :-
1. Enzyme (speed up chemical reaction).
2. transport.
3. structural support.
4. cellular communication.
5. Defense.

* amino acid → monomer for all prdeins.
· 20 nuturall a.a.
· All a.a share acommon structural.
· Formula for an a.a



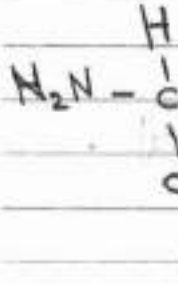
* peptide linkage :-
covalent bond formed between α COOH of the a.a and α NH_2 of another a.a by dehydration reaction.



→ which Number indicaties to peptide linkage ?
→ No. of peptide linkage = No of a.a − 1

ال a.a لو جين :- جه بسمى N terminus ← وجه تسمى C terminus.

20 a.a → non polar (Hydrophobic)
if R end with H, CH_3, ⬡ ring.
→ polar (Hydrophilic)
↳ uncharged (SH, OH) cysteine
↳ charged
↳ (-ve) → R end COO^- (acidic a.a)
↳ (+ve) → if R end with NH_3 (basic a.a)



* levels of protein structure :-

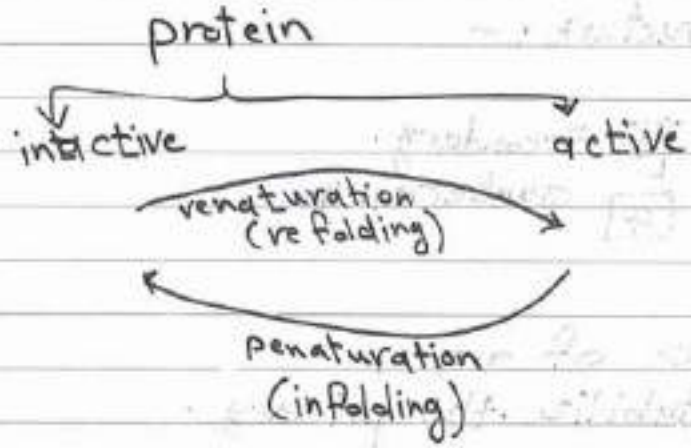
[1] primary
[2] Secondary.
[3] tertary
[4] quaternary

→ primary
1- linear sequance of a.a
2- peptide bond stabilize the primary.

→ Secondary
1- coiling of the poly peptide chain into helicies or sheets.
↳ α-helix
↳ β plated sheet
2- H-bond stabilize the Secondary

→ Tertiary
1- folding of the polypeptide chain to give 3-Dimenival shape
(globular shape)
2- 4. bond stabilize the tertiary
- Ionic bond
- H. bond } → non-covalent
- Hydraphobic interaction }
- S-S bond (disulfide bond) → covalent
↳ 2. aa (cys).

→ Quatinary structure.
1. association between two or more polypeptides.
aggregation
* تتشكل من Tartior
Ex:- heamoglobin.



Denaturation → brack down of protein pond resulting in loss shape and function ...

Renaturation → process of a macromolecule returning to it's native 3-D structure.

2 Factors that cause protein to denature :-
- Temperature (heating)
- pH

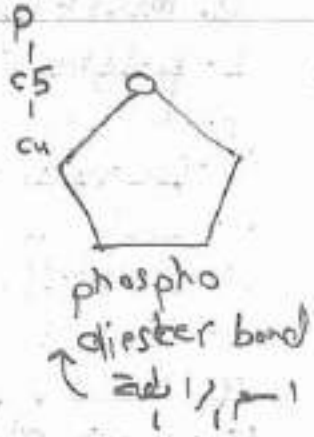
chaperone protein :- helping correct folding of the other protein.
- يساعد على أن يطوي البروتين بشكل صحيح.

* Nuclic acids :-
many nucleotides linked by several covalent bonds called phosphodiester bond.

- The monomer of all Nuclic acid → Nucleotides
  - ↳ pentose
  - ↳ Nitrogenus base (N.B)
  - ↳ P group

* Pentose → ribose (RNA)
→ deoxyribose (منزوع أكسجين) (DNA).

N.B
- A Adenine → Purin (تكون سلسلتين)
- G Guanine
- C cytosine → pyrimiden (تكون سلسلة واحدة)
- T Thymine
- U Uracil



* 2 type Nuclic Acid :-

DNA	RNA
- Deoxynuclic Acid	- ribonuclic acid
- Deoxyribose	- ribose
- A, G, C, T	- A, G, C, U
- 2 strand helix double helix	- strand linear single (one)
- DNA يعبر → RNA	- RNA يعبر → protein

replication
DNA → RNA → protein
transcription translation

DNA 2 strand
- Anti parall
- complemantry
  - A = T
  - G ≡ C

5' A G C T 3'
3' 5'

CH 5: Biological Macromolecules and lipid

1. Macromolecules :- جزيئات كبيرة
2. Micromolecules :- جزيئات صغيرة
3. polymer :- بلمرة (ترتبط بالاحجام الكبيرة)
4. Monomers :- أحادي/وحيد (ترتبط بالاحجام الصغيرة/لوحيده)
5. Dehydration :- عملية نزع الماء (الاسالة)
6. condensation :- تكاثف/تكثيف
7. Hydrolysis :- تحلل أو تفكك
8. Nucleic Acids :- احماض امينية
9. Mono , Di , poly :- احادي ، ثنائي ، متعدد
10. more stable :- اكثر استقرار
11. Helical :- لولبي/حلزوني
12. Fibers :- ألياف
13. except :- باستثناء
14. Exoskeleton :- الهيكل الخارجي
15. Fungi :- الفطريات
16. saturated :- مشبع
17. unsaturated :- غير مشبع
18. Hydrogenation :- هدرجة بمعنى اضافة H
19. Absorption :- امتصاص
20. bilayer :- طبقة ثنائية
21. contractile :- انقباض/انكماش
22. folding :- ينطوي
23. Renaturation :- اعادة تشكيل
24. Denaturation :- تخريب/تكسير
25. Replication :- تضاعف
26. transciption :- ~~ترجمة~~ نسخ
27. translation :- ترجمة
28. Anti - parall :- توازي عكسي
29. complementry :- متمثل
30. pairs :- أزواج

① Small molecule consisting of many similar or idintical building blocks linked by covalent bond is called monomer T/F

② monomer are connected by reaction in which two molecule are covalent bond each other, with the loss of H_2O molecule, the reaction is _____

③ How many molcules of water are need to completely Hydrolyze a polymer that is 10 monomer long ?

④ the simplest carbohydrate are the monosaccharides T/F

⑤ The bond between monomer is broken by _____

⑥ The most common monosaccharide is _____

⑦ monosaccharide are highly diverse in shap only ? T/F

⑧ The starch is energy storage polysaccaride in animal ? T/F

⑨ Similar to Amylopectin but more branched and have two bond $\alpha(1-4)$ & $\alpha(1-6)$ glycosidic linkages is called _____

⑩ Glucose + Fructose ⟶ _____ by _____

(11) Three types of lipids
1 ____ 2 ____ 3 ____

(12) saturated fatty acids have a higher ratio of Hydrogen to carbon than do unsaturated fatty acid T/F

(13) phospholipid are ambivalent T/F

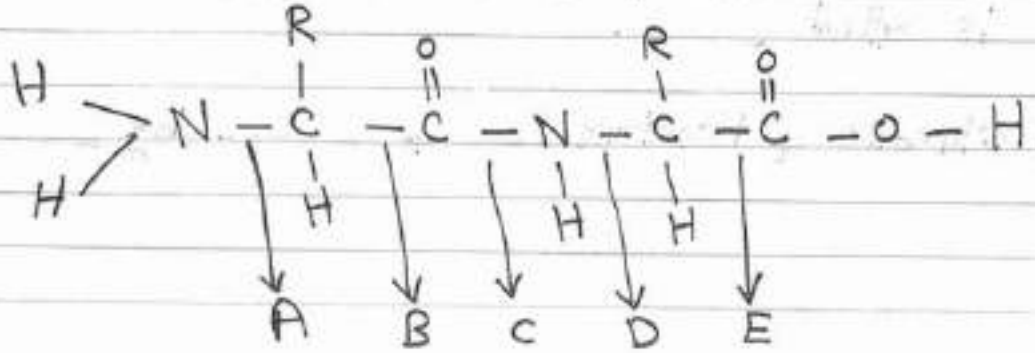
(14) covalent bond formed between α-COOH of the amino acid and α-H_2N of another amino acid is a ____ by ____ reaction

(15) Negatively charged amino acids are those that contain amino group in their side chains T/F

(16) which bond is closed to the N-terminus of the molecule?

(17) which bond is closet to the C-teminus of the molecule?

(18) At which bond would water need to be added to achieve hydrolysis of the peptide, back to its component amino acid?



(19) collagen, ovalbumin, hemoglobin and antibodies all of these are types of protein according to function T/F

(20) The strong bond stabilize the tertiory structure ____

(21) Two factors that cause protein to denature
1 ____ 2 ____

(22) DNA is double strand, while RNA is single strand ? T/F

(23) Hydrophobic interaction stabilize the alpha helix structure of protein ? T/F

(24) If one strand of DNA molecule has the sequance of baces AT TGCA, the other complementry strand would have the sequance ____

(25) Hydrolysis makes monomers and dehyration reaction destroy them ? T/F.

Chapter 7

Cell structure and Function.

الرجوع إلى جدول الكتاب صفحة 82

Organisums : كائنات.
Arise = Come : تنشأ من.
Nucleus : نواة (Nuclei ≈ جمع).
Adapted : تكيّف.
Attaches : تثبت.
Envelope : غلاف.
Condensed : مكثّف ≈ short, thick.
de Condesed : long, thin.
Lamina : صفيحة ≈ Lamella.
Filamants : خيوط.
Nucleolus : نوية (Nucleoli ≈ جمع).
Synthesis : تصنيع.
Organelles : عضيات.
Secretion : إفراز.
LySoSome : أجسام حالة.
VaCuoles : فجوات
Vesicles : حويصلات
Appartus : جسم جهاز
Sacs : أكياس
Tubes : أنابيب
Stacked :
Metabolism : عمليات الأيض
Detoxification : إزالة سمية
Modification : تعديل
Sorting : ترتيب
Shipping : شحن / نقل

Pro : بدائية
Eu : حقيقية
Endo : داخلي Exo : خارجي
Entra : داخلي Extra : خارجي
Inter : بين

Hydrolytic : تكسيري
ACCumulates : تتراكم
Fused : تلتحم
Pigment : أصباغ
OSmoregulation : تنظيم الضغط الاسموزي
Peroxide : فوق أكسيد
Toxic : سام
Respiration : تنفس خلوي
Crista : انطواء ≈ fold.
Matrix : حشوة
Photosynthesis : تركيب ضوئي
Thylakoid : قرص → Granum : مجموعة أقراص
Motility ≈ movement : حركة
Cilia : أهداب
Flagella : أسواط
Centeriol : مريكز
Spindle : مغزلية
Cell division : انقسام خلوي
Anchors ≈ fixed : تثبت
Cleavage furrow : الشق التخصري

CH 7

Cell structure and function

- cell : structural and functional unit in all living organisms
  • وحدة البناء والوظيفة في الكائنات الحية
- cell arise (come) from Pre-exisiting cell
  الخلية تنشأ من خلية موجودة مسبقاً

السؤال هنا : متى تنشأ الخلية

- Microscope → light microscope
  → electron microscope

- Three Important parameters in microscopy are
  ① magnification ② resolution ③ contast

Light microscope (LM) :

- visible light is passed through the specimen and then throug glass lenses
- can megnify effectivly to about 1000 time the actual size of the specimen
- some types of light microscope :
  1. Bright field (Unstained specimen)
  2. Bright field (Stained specimen)
  3. Phase contast
  4. Fluressence

Electron microscope (EM) :

- can megnify to about 1000,000,000 time
- 2 type of EM.
  ① Scanning electron microscope (SEM)
  ② Transmission electron microscope (TEM)

* والذي ينشأ عن ذلك "cytology" علم الخلية

NO

- two type of cell → Prokaryotic, Eukaryotic

* All cells share certain basic features:

1) They are all bounded by selective barrier, called the plasma membrane

2) All cell is a semi fluid, jelly like substance called cytosol

3) All cell contain chromosomes and ribosomes

* chromosomes: carry genes in the form of DNA

• ribosomes: ting complexes that make proteins

* A major difference between prokaryotic and Eukaryotic cell is the location of their DNA

Prokaryotic	Eukaryotic
- No Nucleus	- has Nucleus
- No membrane enclosed organelles	- has membrane enclosed organelles
- No Endomembrane	- has endomembrane
- simple	- complex
- small [Size: 1-5 μ_m]	- Large [size 10-100 μ_m]
- bacteria, Archaia	- plant, animal, fungi, protists elgae

* Cell size is effectedly 2 factor:

1) higher Surface area 2) low volume

* The smaller cell size the ↑ to which is better for the cell [more adapted]

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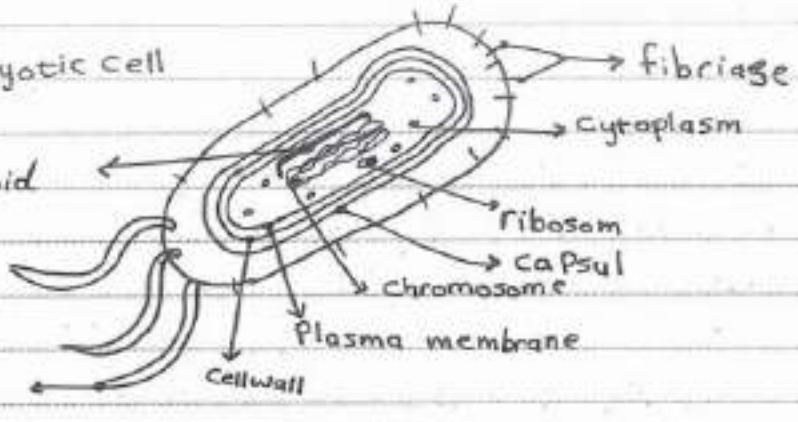
NO.

So all cells [Pro. + Eu.] have 4 cell organelles in common :

1. Plasma membrane
2. Cyto plasm (cytosol)
3. ribosomes
4. DNA (chromosome)

→ ProKaryotic cell



- fibriase: attachment structure on the surface of some pro.
- Nucleoid: region (غير محاط) where the cell's DNA is locatied (not enclosed by membrane)
- Ribosomes: complexes that synthesize the cytoplasm.
- plasma membrane: membrane enclosing the cytoplasm
- Cell wall: rigid structure outside the plasma membrane
- capsule: jelly like outer coating of many pro.
- flagella: locomotion organelles (سوط) of some bacteria

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NO

ملاحظة مهمة
الاطلاع على صفحة 174 - 175 للتعرف على شكل الخلية النباتية والحيوانية
لاتظلم الخلايا النباتية والحيوانية وتعرف عليها زي ماهي فتكون Pro

Eukaryotic cell organells

#Nucleus:

- contains most of the genes in the Eukaryotic cell, houses DNA + Protein : chromosome that carry Genetic information
- control cell activity - 5μm in diameter - The nuclear envelope enclose the nuleus
- Function: Separating it's Contents from cytoplasm
* The nuclear envelop is a double membrane
* Nuclear envelop has Nuclear pores it's function is to regulating the entry and exit of proteins and RNAs
- Nucleus contain DNA molecule [chromosomes] short and thick
- Complex of DNA and protein making up chromosomes is called chromatin → long, thin
- Nucleus cotain dark structure, called Nucleolus
function: synthesis of ribosomal RNA

Cytoplasm = Cytosol + organelles

ribosomes:

- which are complexes made of ribosomal RNA and Protein
- Function: Proten Synthesis
- 2 type of ribosome → Bound
→ free

NO.

- Bond ribosome → attached to the outside in the endoplasmic reticulum or nuclear envlope
- free ribosome : suspended in the cytosol, not attached

* function :

Bond : ① membrane factory ② secretion

free : Synthesis protein used in side the cytoplasm

Endomembran : Endomembraner system.

include :

1. Nuclear envelope 3. Golgi apparatus 5. Vasuoles
2. Endoplasmic reticulum 4. lysosomes 6. plasma membrane

Endo plasmic reticulum

- consist of a network of membraneus tubules and sacs called cisternase
- The E R membrane separetes the internal compartment of the ER called the ER lumen or cisternal space from the cytosol
- 2 type of ER : A) Rough E B) Smoth E.R

A) R.E.R : has bound ribosome on it's surface

Functiaun : ① membrane factory ② secretion ③ protein synthsis

B) S.E.R : has No ribosome on it's surface

function : ① lipid synthisis ② metabolism of carbohydrates ③ detoxification of drugs and poisons

→ Product of ER travel from ER to Golgi Via (by/using) transport vesicles

NO.

Golgi Apparatus:

* membranous sacs and tube stacks over each other called cisternae.
* differing in thickness and molecular composition

Function Golgi:

1) recive products of E.R released as vesicles [at the cis fase of Golgi]
2) modification of E.R products 3) Sorting
4) Packging
5) shipping as new transport vesicles [released from trans-fase]
   - → Lysosome
   - → Vasules
   - → plasma membrane → secreation (exported)

* مبدأ عمل Golgi:

1) Vesicles move from ER to Golgi
2) vesicles coalesce to form new cis golgi cisternase
3) cisternal maturation (مهم): Golgi cisternase move in a cis to trans
4) Vesicles form and leave Golgi: carrying specific product to other locations or to the plasma membrane for secretion
5) Vesicles transport some proteins back ward to less mature Golgi cisternae where they function
6) Vesicles also transport certain proteins back to ER their site of function

NO.

lysosomes

* single membrane enclosed sacs that contain hydrolytic enzymes [that can digest all biological molecules]
* in animal cells (only)
* Hydrolytic enzymes and lysosomal membrane are made by rough ER and then transfer to the Golgi apparatus for further processing.
* 3 function : ① Intracelluler digestion
② recycling of the cell's own organelles and compound a process called autophagy
③ programmed cell death.

* Lysosomal storge disease :-
- Genetic disease
- Lysosomes Lack one of more hydrolytic enzyems
• Example:
Tay- sachs diease : lysosome lacks enzyme that digest lipid or missing or inactive
Lipid → lipids accumlates in brain cells → brain cell damage
So (Lipid - digesting enzyme in messing and the brain becomes Impaired (تالف) by an accumulation of lipids in the cells.

→ Vacoles : large vesicles derived from the ER and Golgi apparatus
-types : ① food vacuoles ② central vacuoles
③ contractile Vacueles فجوات انقباضية

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NO.

→ food vacules : • formed by phagocytosis عكس البلعمة (البلعمة)
• In animal cells only في الخلية الحيوانية

→ Contractile vacuoles : • in animal cell only (paramecium)
• function : ① osmoregulation تنظيم الضغط الاسموزي
② H_2O balance إتزان الماء

→ Central vacuoles : - In plant cell
• Function : ① Store H_2O ② Store organic compounds
③ Store pigment ④ Store inorganic compounds
⑤ Store poisonous compound

→ # Peroxisome :
• single membrane enclosed organelles
• contain enzymes that break down organic compounds
→ H_2O_2 (toxic فوق) Hydrogen Peroxide and contain enzymes that break down
$H_2O_2 \rightarrow H_2O + O_2$ (Non toxic)
So it's function : Detoxification السمية

Mitochondira : - the range 1-10 Mm long
• the site of cellular respiration
• $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O + ATP$
• we can find mitochondira in eukryotic cells
• the metabolic process that uses oxygen to drive the generate ATP by extracting energy from sugar fat and other fuels
• It convert chemical energy in food into ATP by cellular respiretion
• have Double membran enclosed organelles
• The outer membran is smooth but the inner membran is convoluted with infolding called cristae

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NO.

Cont. + mitochondria:

- Inner membran divides into two internal Compartmint
  1. narrow region (between inner and outer membran)
  2. matrix (contain many differ enzymes as well as the mitocondrial DNA and ribosomes)

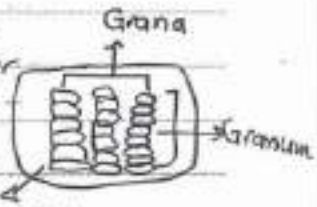
Chloro plast

- 3-6 μm length, found in plant and ~~fungi~~ fungi
- The site of photosynthesis
- it convert the solar energy to chemical energy by absorbing sunlight and using it to drive the synthsis of organic compounds such as suger from carbon dioxide and water

$$6\,CO_2 + 6\,H_2O \xrightarrow{light} C_6H_{12}O_6 + 6O_2$$

Type of plastide

- Chloroplasts [Green] Particularly in root and tuber
- Chromo plast [Colored] has pigment that give fruit and flower their ~~o~~ r orange and yellow hues
- leucplast (colorless) عديم اللون



Thylakoids: are flattened, interconnected sacs and stacked each stack is called granum.

- The fluid outside the thylakoids is the stroma, which contain the chloroplast DNA or ribosomes as wel as enzyme
- The membraanes of the chloroplast divide the chloroplast space into 3 compartments: → ① intermembran space ② The stroma ③ Thylakoid space
- The chloroplast is specilized member of a family of closely related plant organdes called plastids

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NO.

Endosymbiont theory:- نظرية التكافؤ الداخلي

Stat that " mitochondria and chloroplast are prokaryotic cell eaten by Eukaryotic cells

mitochodria (الميتوكوندريا) ميتوكوندريا ابتلعت بدائية النواة ابتلعت بدائية النواة chloroplast

Cyto skeleton

- a network of fibers extending throughout the cytoplasm
- function: mechanical support maintain it shape cell division, movement motility
- component of the cytoskeleton:

1. microtubules 2. microfilament 3. intermediate filament

→ micro tubules:

1. Hulow tuble made from a glabular protein called tubulin
2. Each tubulin protein is a diner [a molecule made up of two subunits]
3. tubulin dimer consists of two different polypeptides [α-tubulin and β-tubulin]
4. microtubules are involved in formation of 4 microtubuler structure: ① Centerole and centrosome ② cilia and flagella ③ Basal bodies ④ spindle fibers

→ centeriole and centrosome:-

- Centeriole: animal cell structure
- Centrosome: region where centeriole is located
- A pair of centeriole in centrosome of animal
- function: give rise to spindle fiber that spear chromosome during cell division

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NO.

- A section of ceteriole show:
  - → nine sets of triplet microtubules arranged in a ring
  - → 9 + 0 microtubuler arrangment.
    - 0 → no center microtubles
    - 9 → a fused triplets
  - → cillia and flagella
    - the sperm of animal, algae and some plant have flagella
    - the paracimum have cilia
    - function: cell movement or cell motility
    - section in cilia and flagella shows:-
      - → 9 doublets of microtubule are arranged in ring, with 2 single microtubules in it.
      - → 9 + 2 → microtubuler arrangment seperated microtubules (in center)
        - 9 → fused doublets
    - Motile cilia usually in larg. number on the cell surface
    - flagella are usually limited to just one of a few cell
    - flagella are usually limited to just one of afew cell
    - flagella are Longer than cillia
  - → spindle fibers: • seperate chromosome during cell divison
    - arise from centeriole
    - section in spindle show: 9+0 microtubler arrangment
  - → Basall bodies:- • located at the base of cillia and flagella
    - It Anchors cillia and flagella to the cell
    - basal bodies arise from centeriole cell that lack centeriole can't move

NO.

Cont.→ Basal bodies : • Section shows : 9+0 microtubuler arrangment similar to centeriol

Microfilament :

• They are also called action filament. {why? Because they are built from molecules of action, a globular protein

• a twisted double chain of action subunits.

function : ① cytoplasmic streaming (تيار)

② cell division in animal cell by formation of cleavage furrow

③ cell movement (motility) in animal cell by ambeboid movement using pseudopodian

④ action filament along with myosine by helping muscle contraction يساعد في

→ # Intermediate filaments

• filament made of protein called Kariatin

function : ① support ② cell shape ③ anchoring - [Fixing] organelles in place تثبيت

④ formation of nuclear lamina

Cell wall

• coat (غلاف) of cellulose surround plant cell

• cell wall are much thicker than the plasma membrane

• ranging from 0.1 μm to several micrometers

function :

support, protection, cell shape, prevent excess H_2O uptake OR water (H_2O) balance

NO.

Cell wall
- Primary wall : outer, flexible, thin, made of celluse
- secondary : inner, rigid, thick, made of cellulose and lignin
- middle lanella : thin layer made of pectin

Speparate primes
wall of adjaccent plant cells

• cell wall has pores (channels) called plasmodesmata

Extra Cellular matrix [E.C.M].

• Net work of glyco protein molecules attaches to the outer animal cell plasma membrane.

• glycoprotein molecules of ECM include:

① collagen [most abundent] ② fibronectin ③ proteglycen

Function :

1) cell marker 3) attaching of cell
2) cell - cell comunication 4) cell development
5) cell regulation

* Integrin :-

→ some cells are attached to the ECM by ECM glycoproteins such as fibronectin, fibronectin and other ECM protein bind to cell - surface reptor protein called Integrin that are built in plasma membran

↳ integrin attaches cytoskeleton to E.C.M

↳ a position to transmit signals btween the ECM and cytoskeleton

NO.

Cell Junction :

• Neighboring cell often adhere, interact and communicat via site of direct physical contact

• inter cellual junction : cell structures found btwen cells

function: cell attachment, bonding, holding

• Animal cell junction :

① Tight junction ② Desmosomes

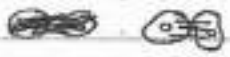
③ Gap junction ④ Plasmodesmata in plant

① Tight junction :

protein junction fast (تشبث) cells together tightly enough like belt block (prevent) the space between

② Desmosomes : protein filament hold cell into strong sheet but allow spase between cell

③ Gap junction : protein channels (pores) allow tran-sport of small substances from one cell to another



④ Plasmodesmata : protein pores (channels) allow transport of small substanes from one cell to another [between adjacent cells], similar to Gap Junction

NO.

	Animal cell	Plant cell
Cell wall	×	✓
lysosome	✓	×
Contratile vacules	✓	×
food vacule	✓	×
mitochondria	✓	✓
Chloroplast	×	✓
Centersomes	✓	✓
Centeriole	✓	×
E.C.M	✓	×
micro filiment	✓	✓
Cetral vacules	×	✓

which consist of : ممايتكونت كل من

① chromosomes : DNA + Protein
② Microtubles : tubulin (protein)
③ micro filament Actin (protein)
④ Intermediat filament : Keriatin (Protein)
⑤ Cell wall : cellulose .

توكل على الله ♡
و
قوي قليك الا متحان
انتي - قدها ☺

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NO.

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CH_7

Problem :-

1. Which is true about Ribosomes :
- Contain DNA Protein.
- Are Active in Carbohydrates synthesis.
- Subunits Are formed by the Nucleolus.
- Polyribosome are the subunits of ribosome.

2. Which organelle modifies proteins that will be secreted :
- Lysosome.
- vacuole.
- Mitochondria.
- Golgi appartus.

3. Which of the following would tell you whether a cell is Prokaryotic OR Eukaryotic :
- Presence or absence of cell wall.
- presence or absence of organalles bound by membrane.
- presence or absence of Ribosome.
- Whether or not the cell Contain DNA.

4. In plant cell, Protein Synthesis occure in/on the :
- Cytosol.
- Rough ER.
- Matrix of the Mitochondria.
- Stroma of chloroplasts.
- All of the above.

5. Which of these is Not part of the Endomembrance system of Cell:
- Mitochondria.
- Golgi apparats.
- Lysosome.
- Endoplasmic reticulem.

6. Organelles that Contain DNA include:
- Ribosome.
- Chloroplast.
- Mitochondria.
- Only Chloroplast and Mitochondria.

7. Larg number of ribosomes are present in Cells that specilize in producing, which of the folloing molecules:
- Lipids.
- Protein.
- Glugose.
- Steroids.
- Starch.

8. Which of cell Components is not directly involved in Synthesis or secretion:
- Golgi Complex.
- Smooth ER.
- Lysosome.

9. Which play role in interCellular digestion:
- Lysosome.
- Ribosome.
- Chloroplast.
- Golgi Complex.

10. Which structure is site of the synthesis of protein that may be exported from the cell :
- plasmodesmata.
- Lysosome.
- Golgi vesicles.
- Rough ER.
- tight junction.

11. Golgi apparats secretes many polysaccharid. (T/F)
12. Smooth Endoplasmic reticolum store Calcium ions. (T/F)
13. Which of the following features of prokaryotic & Eukaryotic. have in Common :
- Ribosome.
- Mitochondria.
- Nucleus.
- Cytoplasm.
- plasma membran.

14. Which of following relationship between Cell structure and their function:
- Chloroplast : Bit of Cellular respiration.
- Chromosome : genetic Control information.
- Ribosoma : site of protein synthesis.
- Mitochondria : formation ATP.
- Cell wall : support , protection.

15. A special Arrangment of microtubule is responsible for the structure of flagella and Cillia. (T/F).
16. Mitochondria have an inner membrane system Called Hylakoid membrane. (T/F).

17. Within the centrosome of an animal cell are a pairs of centriols. (T/F).

18. All of following are used to maintain the shape of animal cells Except:
- Mitochondria.
- Microfilament.
- Cell wall.
- intermediate filament.

19. All of the following about peroxisome correct except:
- They are organelles bounded by single membrane.
- Contain Enzyme tranfer hydrogen from substance to oxygen.
- Contain Enzyme convert H to water.
- Come from the Endomembrane system.

20. Microfilament of cytoskeleton are made of Myosine protein. (T/F)

21. Some plants cells and thick secondary cell wall outside the primary cell wall (T/F).

22. The cellwall of plant cells consist of:
- Cellulose fibre embedded in matrix of other polysaccharied and protein.
- pectin.
- Starch and Glucose.

23. RNA is double stranded, while DNA single strand. (T/F)

24. The middle lamella is a thin layer between primary walls of adjacent plant cells and is made of cellulose. (T/F)

25. All of the following are used to maintain the shape animal cell Except:
- Microtubules.
- Microfilament.
- Cell wall.
- intermediate filament.

26. Organelles that Contain DNA include :

- Ribosome.
- Mitochondria.
- Chloroplast.
- Mitochondria and chloroplast only.
- Ribosome, Mitochondria and chloroplast.

27. Which of the following would be found in animal cell, But Not in a bacterial Cell :

- DNA
- plasmamembrane.
- Endoplasmic reticulum.
- Cell wall.
- Ribosome.

28. What is the innermost portion of some mature plant cell walls called :

- primary cell wall.
- Middle lamella.
- tonoplat.
- Secondary cell wall.
- glycocalyx.

29. Plasmodesmata in plant cells are similar in function to which structure in animal cells :

- peroxisome.
- gap junction.
- tight junction.
- desmosome.
- glycocalyx.

30. A cell has the following molecules and structures : Enzyme, DNA, ribosome, plasma membrane, and Mitochondria. It could be a cell form:
- a bacterium.
- an animal, but not a plant.
- a plant, but not an animal.
- a plant or an animal.
- Any kind of organism.

31. Which of the following is capable of converting light energy to chemical bond energy:
- Chloroplast.
- leucoplast.
- Golgi bodies.
- Mitochondria.
- peroxisome.

32. "Granum" is a term closely associated with :
- Golgi apparatus.
- Mitochondria.
- Ribosome.
- Chloroplast.

33. Which of the following is the correct sequence of plant cell wall layers, beginning with the outside and progressing inward to the plasma membran:
- middle lamella, secondary wall, primary wall.
- middle lamella, primary wall, secondary wall.
- secondary wall, primary wall, middle lamella.
- primary wall, middle lamella, secondary wall.
- secondary wall, middle lamella, primary wall.

34. Which of these in not part of the Endomembrane system of Cell :

- Mitochondria.
- Lysosome.
- Endoplasmic reticulum.
- Microbodies.

35. Which is Not a characteristic of chloroplasts :

- They are Surrouded by a double membrane.
- They Contain Hylakoid.
- Chlorophylls are found in the fluid Stroma.
- Chlorophylls absorb Solar energy is which used to form chemical energy.

36. Mitochondria :

- Carry on Cellular respiration.
- are surrounded by a Single membrane.
- break down ATP to release energy for the Cell.
- Contain grana and Cristae.

37. To what does the term "stroma" refer:

- The double membrane of Chloroplast.
- a flattened disk or sac in the chloroplast.
- a stacked of Hylakoid membrane structure.
- The Central fluid-filled space of the Chloroplast.

38. Cristae are associated most closely with:

- Lysosome - ribosome - plastids - Mitochondria.

39. The Rough endoplasmic reticulum is Covered with:

- Mitochondria. - Lysosome.
- Ribosome. - plastids.

The End. ☺

Energy and Life

CH.6

Metabolism: الأيض
occur: تَحدُث
Catabolism: الهدم
Anabolism: البناء
processes: عمليات
reactions: تفاعلات
produce: إنتاج
release: إطلاق
bilding: بناء
synthesis: تركيب
Consuming: إستهلاك
Capacity: القدرة
object: جسم
Surrounding: المحيط
universe: الكون
amount: كمية
randomness: العشوائيه
disorder: الفوضى
Conclusion: إستنتاج
Constant: ثابت
quantity: كمية

quality: جودة/نوعية
downhill: إنحدار
uphill: صعود
Cupling: يربط
Catalyts: محفز
Optimal: مثالي
temporally: مؤقت
permanent: دائم
site: موقع
Inhibit: تثبيط
regulation: تنظيم
Conentration: تركيز

Metabolism: Sum [Total] of all chemical reaction that occur in living cells.

metabolism

catabolism
{catabolism reaction}

Anabolism
{Anabolism processes}
OR: anabolism reaction

➡ catabolism [degradative processes]
[break down pathway]:
breaking down complex molecules to simpler compounds to produce [release] energy [ATP].

➡ Anabolism [bio synthetic pathways]:
building [synthesis] of large complex molecules from small simple molcule by consuming energy (ATP).

* مثال على (Catabolism) عملية التنفس الخلوي (Cellular respiration)
يكسر سكر الجلكوز ومركبات الطاقة (ATP) لينتج (ثاني أكسيد الكربون + ماء).

* مثال على (Anabolism) تشكيل أو تركيب الحمض الأميني [Amin acid] من جزيئات بسيطة أو صغيرة، وتركيب أو تشكيل البروتين من أحماض أمينية [Amino acids].

Energy : is the capacity to cause change.

* energy is important why ?
  beacuse some forms of energy can be used to do work.

(Energy)

Kinetic energy — potential energy

→ Kinetic energy : energy of motion .

Ex.1 Thmal energy. [الطاقة الحرارية]

- is Kinetic energy associted with the random movement
- of atoms or molecule.
- thermal energy in transfer from one object to anther is called heat.

Ex. 2 Light energy.

→ potential energy : energy of Location [stored energy].

Ex1 chemical energy stored in food bonds [Covelent bond].

- Energy Transformation :
  Change from one to anthor [change in Form].
- themodynamics [علم الحركة].
  study of energy transformation.(system) ← * الجسم الذي بدرسه اسمه
- system : object under study contain energy.
  (يعني أي جسم في طاقة)
- every thing out side system as the surrounding.
  - Surrrounding:(الطاقة يسمح بتحول) (يعني المحيط الذي
- universe : all system + surround.
- Enthalpy (H) : energy in system ← كل الطاقة الموجودة في ال (system)
- Free energy : useful energy : (الطاقة المستخدمة)
- heat : lost energy ≡ unuseful energy.
- Entropy (s) : Measure of randomness. ← شكل من أشكال ال (heat)
  ≡ amout of disorder.
  (الطاقة الضائعة أو العشوائية)
- system → isolated system.
  → open system.

* isolated : is unable to exchange either energy or matter with it's surroundings outside the thermos.
* open : energy and matter can be transferred between the system and it's surroundings.

Note organisms are open systems. (يسمح بتبادل الطاقة)

* Two Laws of thermodynamic: (قانون حفظ الطاقة)

[1] The First Law [law of energy conservation].
stat that: Energy can be transferred and transformed but it

- Conclusion "إستنتاج": in universe quantity [amount] of energy is Constant but quality [form (shape)] of energy is not.

[2] Seconed law of thermodynamics:
state that: Every energy transfer or transformation increases the entropy of the universe.
(كل ما الطاقة تشتغل من مكان لآخر أو من شكل لآخر بتزيد الطاقة الضائعة).
- conclusion: part of the system energy must be lost (lost energy is called heat).

* part of the system energy is used to do work the other part is lost as heat.
* part that is used to do work (useful energy) is called free energy.

* Gibbs free energy (G):

- Free energy: is the partion of system's energy that can perform work when temperature and pressure are uniform throughout the system As in aliving cell.

* Gibbs free energy equation:

$(\Delta G = \Delta H - T.\Delta S)$

where: ΔG: The change in free energy.

ΔH: The change in Enthalpy.

ΔS: The change in entropy.

T: absolute Temperature (in Kelvin (k°) units).

Note $k° = c° + 273$.

$$C_6H_{12}O_6 + 6O_2 \longrightarrow 6O_2 + 6H_2O + ATP$$

reactants (R) product (P)

* $\Delta G = G_P - G_R$: this is called free energy change equation.

(a) $\Delta G < 0$ (-) $[G_P < G_R]$.

- reaction is spantanouse
- Catabolism , - Hydrolysis
- reaction is exergonic

* Exergonic reaction : process with anet release of free energy.

- G value down hill , **Ex** protein → a.a

(b) $\Delta G > 0$ (+) $[G_p > G_R]$.

- reaction is non spontanouse
- Anabolism , - dehydration
- reaction is Endergonic

* Endergonic reaction : that absorbes free energy from it surrounding.

- G value is uphill ,

Ex] Nuclutides → dNA.

(c) $\Delta G = 0$.

Never found ⇒ $G_p = G_R$

- cells favor disequilibrium : الخلية تحتضر للموت

* Celluler works : any process requiring energy. ← أي عملية تحتاج طاقة في الخلية تسمى

- Mechanical [muscle contraction].
- Transport [pumps] مضخات
- chemical reaction.

* Catabolic reaction $\xrightarrow{Energy}$ ATP → celluler work.

- ATP Couples / link : يربط Catabolic reaction to endergonic Celluler work

ATP ⇒ Adenosine Triphosphate.

يتكون من ⇒ (ribose + Adenine + 3 P group).

- ATP $\xrightarrow{\text{hydrolysis}}$ ADP + P $\rightleftharpoons$ 7.3 (سالبة) [Catabolism].

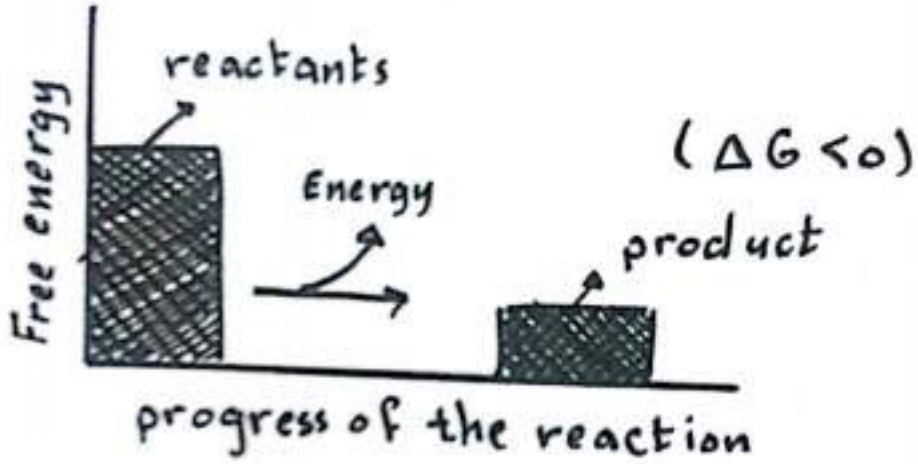
(غير عفوي) ΔG

- + 7.3 + ADB + P $\longrightarrow$ ATP [Anabolic].

(موجبة)

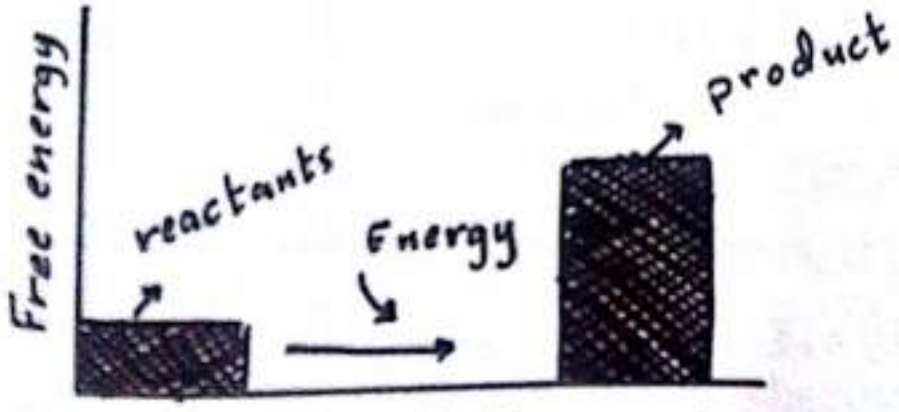
phosphrelation : عملية إنتاج الـ ATP

[A] Exargonic reaction: energy released, spontanous.



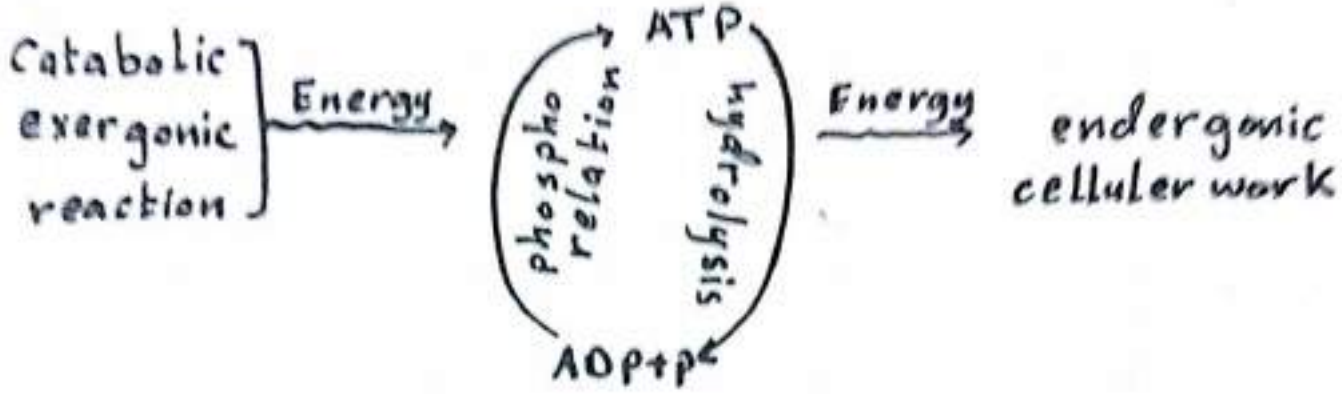
($\Delta G < 0$)

[B] Endergonic reaction : energy required non-spontanous.



- ATP energy Coupling (يربط) mechanism of ATP.

* [How ATP power (driver Celluler work)]



* Q How ATP Couples exargoinc reaction to celluler work??

① ATP hydrolysis, provide energy that convert endergonic reaction into exergonic

② P can phospholylate reactions, so, they become highly reactive.

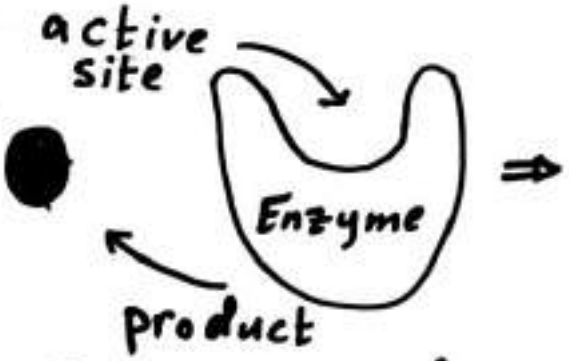
Enzyme : is macromolecules that act as a chemical agent that speed up areaction without being consumed by the reaction.

- Biology Catalysts : الإنزيم لا يستهلك في التفاعل
- most of them are proteins.

- All Enzyme have active site [موقع نشط].

* (R) reactant in Enzyme reaction are called Substrates (S).

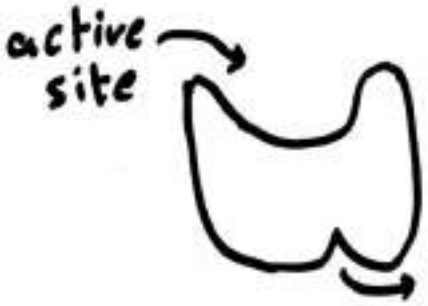
→ Active Site : region (part) on Enzyme where substarate bind to Enzyme and converted to product (p).



- بمجرد إرتباط S بـ E يتحول إلى P تتم هذه العملية بأجزاء من الثانية

- E are S specific → Each E has it's own S

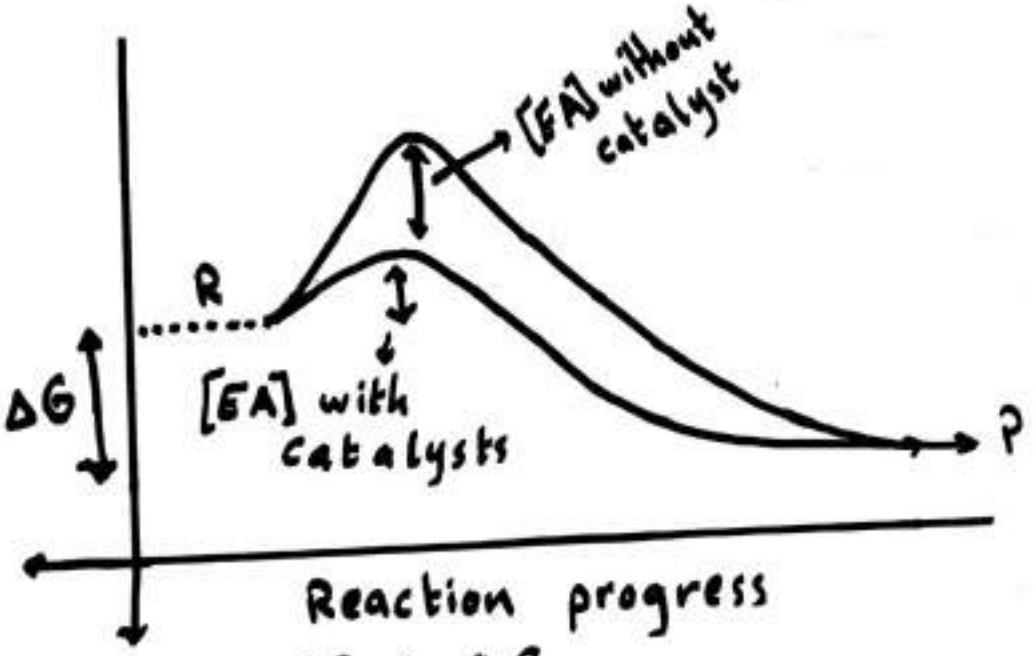
* Some E has allosteric (regulatry) site.
↳ site other than active site used to regulate E activity.



Q] How E speed up reaction?
by lowering energy of activation.

[redacted] • Energy of activation ≡ Energy of Barrier
[EA] (طاقة التنشيط)

→ Thermal energy obsorbed by the reactant in order to start the reaction : الطاقة اللازمة لبدء التفاعل



- E never Effect ΔG.
E never Effect K equilibrium.
E+S ⇌ ES complex ⇌ E+P.

• E+S → ES Complex → E+P
(not effected / not consumed)

* هنالك نماذج فسرت تكوين الـ [ES complex]:

- 2 model Explain Formation:

[1] lock and key model : نموذج القفل والمفتاح

- E never change in shape [conformation] befor or after bonding to S.

يعني شكل الإنزيم قبل التفاعل نفسو بعد التفاعل.

[2] Induced - Fit model : نموذج التلائم المستحث

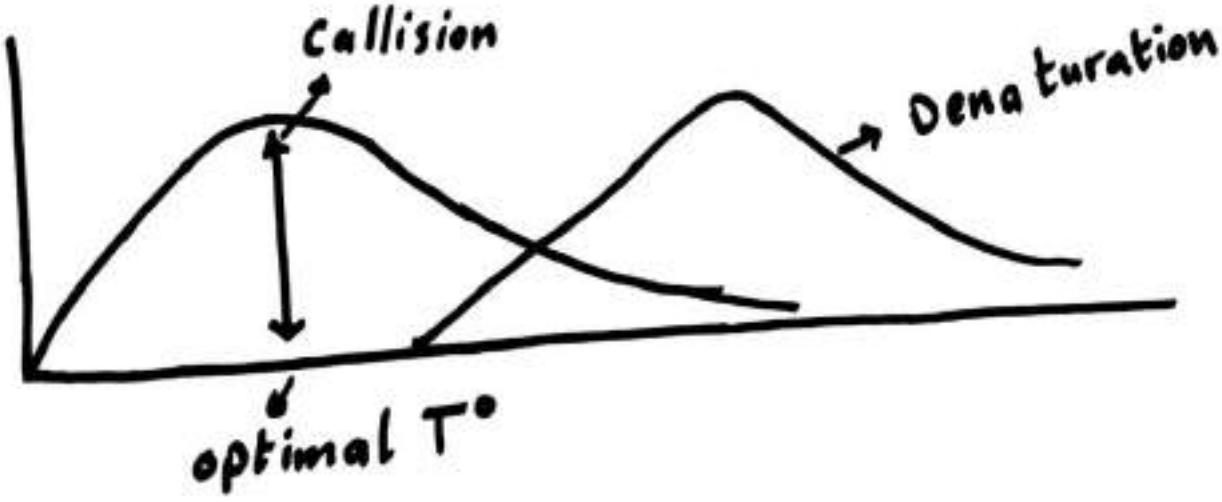
- E change in shape slightly a site binds to S so, E become more suitable to S.

يعني لما مرتبط S بالـ E راح يتغير شكل الإنزيم وتنشاطه يزداد.

[3] Factor that Effect E activity:

[1] Temperature [T]:

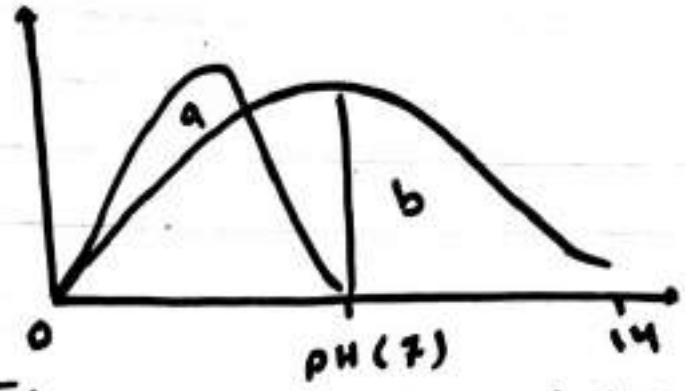
- optimal T (25°).
- Denaturation. (في حال ارتفعت أو قلت T راح يخرب الإنزيم)
- in Cablision between E and S:



[2] pH :

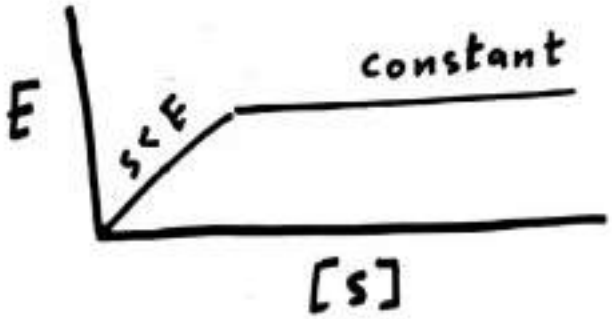
ⓐ Denaturation.

ⓑ optimal pH.



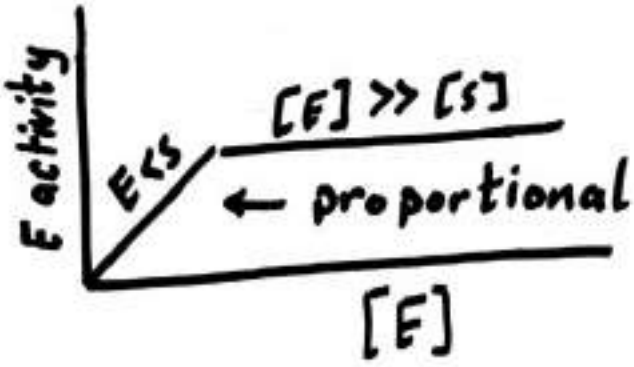
[Ex] pepsine in Stomach (pH = 2)

[3] [S] : substrate Concentration



- ثبتنا كمية E وبلشنا نزيد S رح يزيد [E A] والعلاقة تكون طردية، لكن بعد فترة النشاط يثبت لأن [E] >> [S] يعني أصبح E مشبع يعني كل الـ E رابطة مع S.

[4] Enzyme



- ثبتنا [S] وبلشنا نزيد [E] رح يزيد [E A]، والعلاقة طردية لكن بعد فترة النشاط رح يثبت لأن [S] << [E].

[5] Cofactor:

→ Substances needed in small amount for proper (correct) E active.

2 types → inorganic: such as Metales (المعادن) [cofactor] [Fe, Mn, Ca..].

→ organic: vitamines [coenzyme].

[6] Inhibitors (I): substances block [stop] E activity.

2 types

Compatitive

- Similar in shape
- [I] bind to active site instead of S.

- To solve the problem of Compatitive [I] → ↑ [S].

Non-Compatitive [Allosteric I].

- [I] not similar in shape
- [I] bind to allosteric site./regulating site.

→

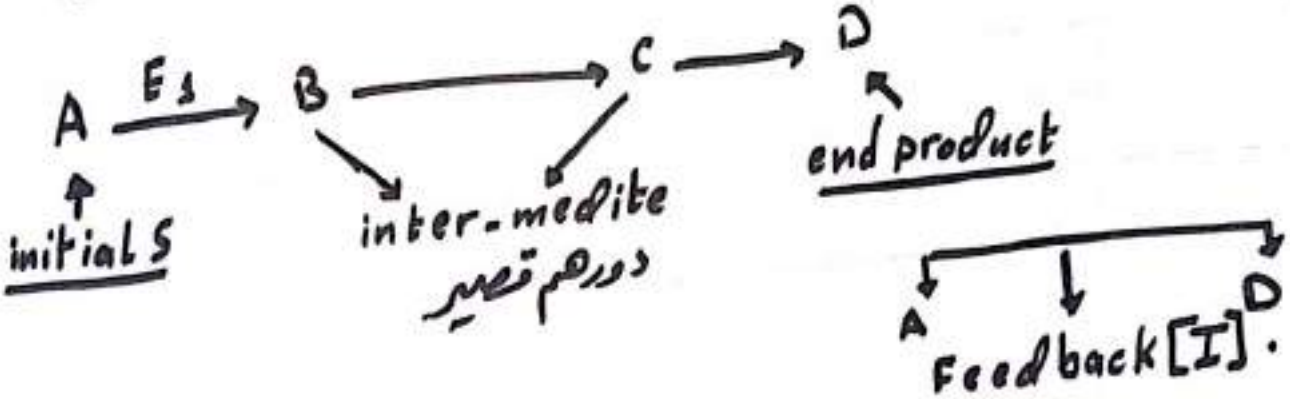
* Inhibition type according to the way of binding to E:

1. reversible [I]: E bind to I non covalently. (week).
   مثبط منعكس
2. irreversible [I]: E bind to I covalently. (strong).
   مثبط غير منعكس

* Control of E activity:

① Feedback inhabition: product in pathway stop (block, inhibit) E in early steps in the pathway.
② Alostric regulation, ③ Cooperativity.

④ Metabolic reaction in the cell occur as pathway:
- pathway: Series of reactions, the [P] for reaction is [R] for the next.



[1] Feedback inhibition:

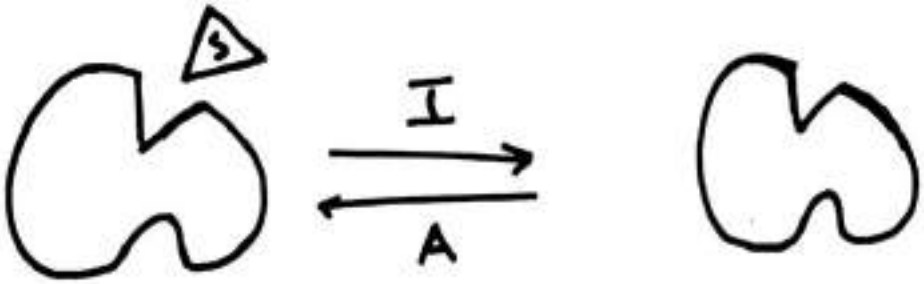
As product at the end of the pathway Inhibit E early in the pathway

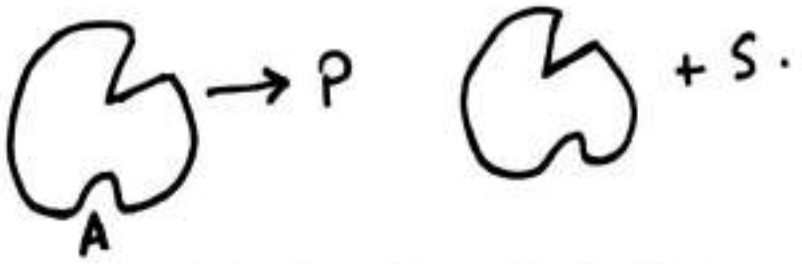
[2] Allostric regulation : used in Allostric E (control)

→ Allostric site.

(All allostric E)

Active in Active



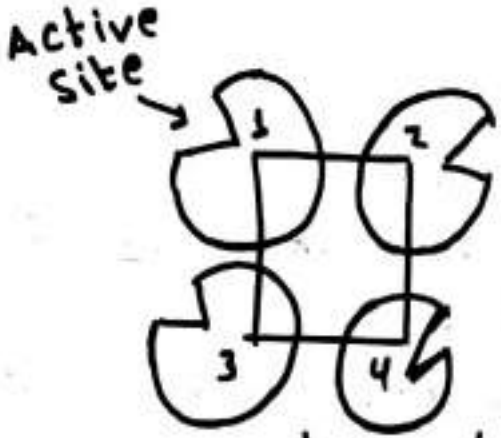
* → 

- allostric I & allostric Activitor.

≡ (allostric Regulation).

[3] Cooperativity

- used in E at the Quaternary Level.
- E made from Several polypeptide (= Subunits) [Each polypeptide is called subunits].



* كل subunite يمتلك active site واحد ترتبط معها بكفية substrate.

↳ Induced fit.

- binding of on S to one Subunits. will cause induced fit in all subunit in the same time.

* problem *

Q1 whenever energy is transformed, there is always increase in the :

A) entropy of the universe.
B) free energy of the system.
C) entropy of the system.
D) enthalpy of the universe
E) Free energy of the universe.

Q2 The mathmatical equation for the change in free energy of a system is :

$\Delta G = \Delta H - T\Delta S$, which of the following incorrect ?

A) T is absolute temprature.
B) ΔG is the in free energy.
C) ΔH is the change in Heat.
D) ΔS is the change in entropy.
E) Both A and B are In Correct.

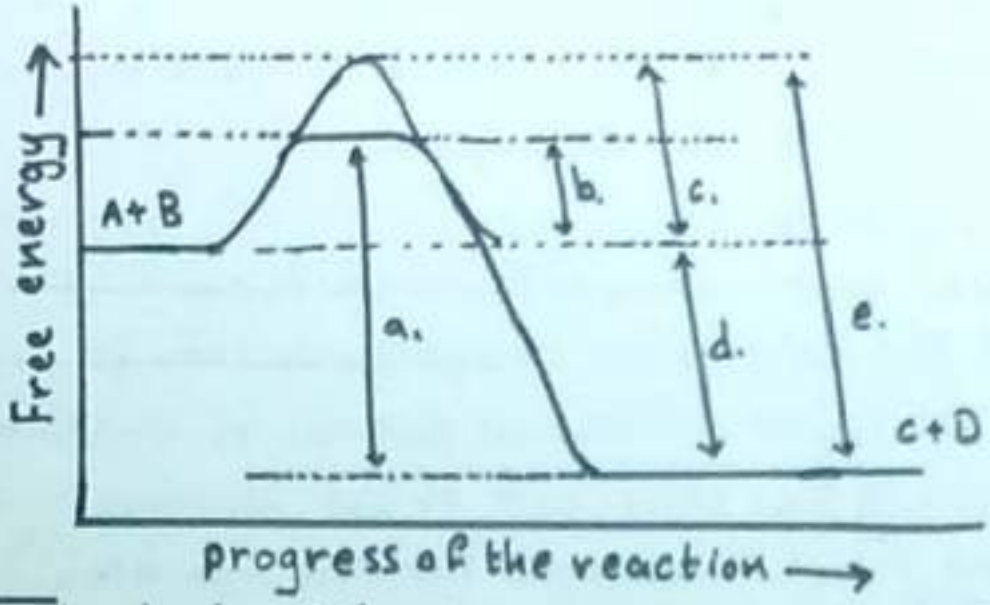
Q3 Reactants in a reaction must first over come a thermodynamic barrier known as the reactions:

A) Activation energy B) heat content.
C) free energy content D) entropy.
E) endo thermic Level.

Q4 what is an organic, non protein required by an enzyme molecule called ?

A) functional group B) alloseric group.
C) active Cofactor D) accessory enzyme.
E) coenzyme.

- the following questions (5+6) are based reaction A+b → c+d shown in figure:



Q5 which of the following terms best describes the reaction?

A) Exargonic B) non Spantaneous
C) Anabolic D) allostric E) endergonic.

Q6 which of the following represents the ΔG of the reaction?

A) a. B) b. C) c. D) d. E) e.

Q7 The mechanism in which the end product of a metabolic pathway inhabitis an earlier enzeme in the pathway is known as:

A) Feedback inhibition B) Allostric inhibition.
C) metabolic inhibition D) reversible inhibition.
E) non cooperative inhibition.

Q8 what term is used to describe the transfer of free energy from catabolic pathway to anabolic pathway?

A) bioenergetic B) Feed back regulation
C) cooperativity D) entropy
E) energy Coupling.

Q9 How does a non-competitive inhibitor decrease the rate of an enzyme reaction?

A) by decreasing the activation energy of reaction.
B) by changing the structure of the enzyme.
C) by acting as a Coenzyme for the reaction.
D) by binding at the active site of the enzyme.

Q10 During spantaneous reactions the amount of free energy increases: T/F.

Q11 A substrate molecule bound to an active site of one subunit of an enzyme affects the active site of several subunits is known as Cooperativity: T/F

CH8 :- Cell Membranes.

Cell Membranes :- الأغشية الخلوية
bilayer :- طبقتين
Shelters :- مأوى / ملجأ
exposing :- كشف / عرض
Saturated :- مشبع
unsaturated :- غير مشبع
embedded :- انغماس / امتداد
Integral :- مقترن
Peripheral :- محيطي / خارجي
Fluidity :- ميوعة
Increase :- زيادة
dicrease :- نقصان
Packing :- تجمع
unpacking :- عدم التجمع
Buffer :- منظم
Proportion :- نسبة
distinct :- متميز
dissolve :- ذائب
rapidly :- سريع
transport :- نقل
Channels :- قنوات
Passive :- سلبي
Active :- نشط
Concentration :- تركيز
Gradient :- تدريجي
Diffusion :- انتشار

Osmosis :- الخاصية الاسموزية

Isotonic :- متساوي الضغط

hypotonic :- اقل ضغط/تركيز

hypertonic :- اعلى ضغط/تركيز

Swell :- تضخم

Bursting :- انفجار

Shrink :- تقلص/انكماش

Flaccid :- مترهل/رخو

Plasolysis :- انحلال الخلية

response :- استجابة

receptor :- مُستقبل

Stimulus :- تحفيز

unqual :- غير متساوي

Distribution :- توزيع

Cell Membranes

→ plasma membrane

* outer boundry that surround all cells.
* it's controls traffic into and out of the cell
* the plasma membrane exhibits selective permeability.
* several models were proposed to explain plasma membrane structural and functional. The most accepted model was : [Fluid Mosaic Model]

يعني اقترحو عدة نماذج لتفسير او توضيح الـ Plasma membrane من ناحية البناء و الوظيفة ، فوجدو أنسب اقتراح هو Fluid mosaic model

- Proposed by Singer and Nicolson 1972
- According to fluid mosaic model :-

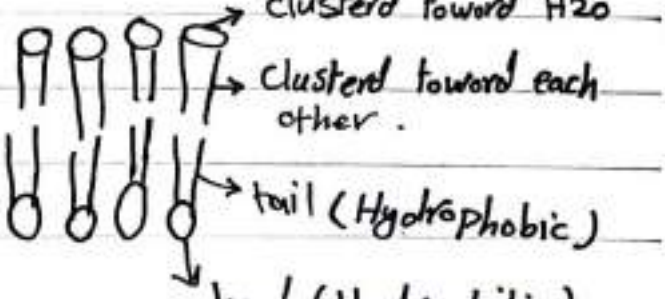
[A] plasma membran structure is composed from :-

① Phospholipids ② Protein
③ CH2O (Carbohydrate) ④ Cholostrol

→ phospholipids

as phospholipids bilayer

Can exist as stable boundry btween to aqueous compartment becouse the molecular arrangment shelters. the hydrophobic tails of phospholipid from water while exposing the head to water.

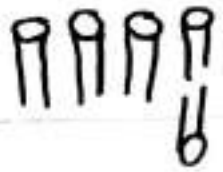


A phospholipid is an amphipathic molecule
↳ it has both ahydrophilic region and ahydrophobic region.

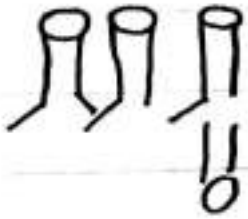
So; the Flouid mosaic model is meane the membrane is a masaic of protein molecule bobbing in fluid bilyer of phospholipids.

2 type of phospholipids in the membrane :-

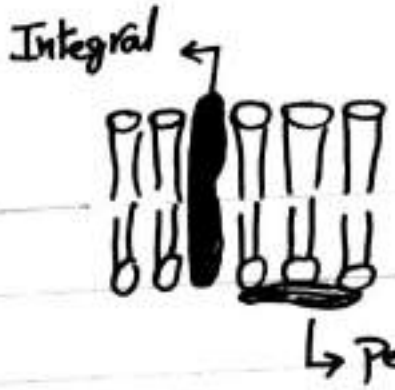
1. Saturated
   - Solid - No kink



2. unSaturated
   - Liquid - kinks



→ Proteins
embedded in the fluid matrix of lipid bilayer
2 type of Protein :-
① integral protein ② Peripheral protein



رسم توضيحي 00
يليز ادجع لرسمة الكتاب :^

* Integral protein.

- Penetrate the hydrophobic interior of the Lipid bilayer
- The majorty are transmembrane proteins.
- Function :-
  1. Transport .
  2. Enzymes .
  3. cell - cell recogenation.
  4. attaching E.C.M to cytoskeleton.
  5. Inter cellular joining.
  6. Signal transduction [خَوِيل الإشارة].

* Peripheral protein.

- are not embedded in the lipid layer at all.
- there are bound to the surface of the membrane.

→ cH2O (Carbohydrates.

- Short branched sugers (15 unite).
- attached to the outer surface of animal cell.
- Some are covalent bounded to protein ; forming molecule Called **Glycoproteins**.
- some are covalent bonded to lipid ; forming molecule Called **GlyColipids**.
- Function :-
  1. Part of E.C.M
  2. Cell Marker
  3. Cell - cell recogenation [Communication].

→ Cholestrol

- in animal cell plasma membrane.
- Function: membrane maintain fluding.
- 2 charactristic of membrane :-
  1) The membrane is Fluid .
  2) The membrane is sided.

The membrane is Fluid :o

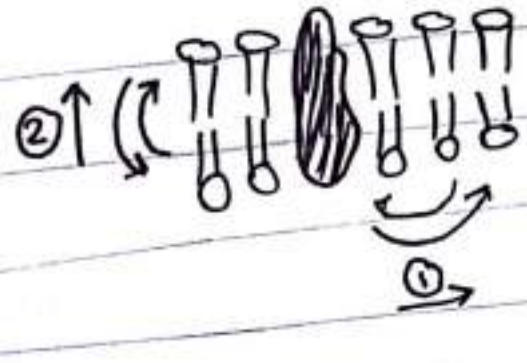
- it is component [especially phospholipid] Can move but Limited movement

* حركتها اسرع من ال protein لانها أصغر.

- 2 type of phospholipids movment

① Leteral
- [sideway movement]
- [Frequent] متكررة الحدوث
- movement of phospholipid in the same Layer.

② Transverse [Flip-Flop]
[rare] نادرة الحدوث
movement of phospholipid from one layer to another



للتوضيح ←

④

- Factors that effect membran fluidity :-

[1] Temperature [3] % unsaturated Phospholidips [percentage].

[2] Cholestrol

Temperature

- at moderate [25°-35°] Temp the membrane in fluid
- at increase ↑ ⇒ ↑ Fluidity [Liquid]
- at dicrease ↓ ⇒ ↓ Fluidity [Solid]

* عند الكائنات تتحول الخلية

cholestrol

- maintain membrane Fluidity in animal cells.
- cholestrol ↓ fluidity at ↑T° ; by preventing phospholipid unpacking يمنع عن بعض
- cholestrol ↑ fluidity at ↓ T° ; by prevention phospholipid Packing (يمنع.]
- cholestrol is fluidity Buffer

* الكولسترول - حافظ على درجة الحرارة المناسبة والمتوازنة

يعني يقوم تعديل درجة الحرارة .

Percentage unsaturated Phospholipids.

- In plant cell
- at ↓ T° plants ↑ % unsaturated (Kinks ↑).

to prevent Packing ⇒ then the membrane fluid.

- at ↑ T° plants ↓ unsaturated ⇒ than the membrane stay fluid.

Ex:- winter wheat [قمح الشتاء]

at ↑ increases unsaturated phospholipids

at winter (↓T°), when T° drops

لـ منتجة جبّا (شديدة البرودة).

The membrane is sided

- the two Layer in the membrane are distinct ولكنهما may differ in Lipid composition and protein has directional orientation in membrane.

[B] Membrane Function :-

- Transport across the membrane :-

A cell must exchange molecules and ions with it's surrounding.

* Transport across phospholipid [selective permebility]

[1] Small non-Polar [Hydrophobic] substances can Pass easy and rapidly / quickly such as : O_2 & CO_2.

→ Can dissolve in lipid

[2] Small Polar [uncharged] Can Pass slowly

e.g :- H_2O, Ethanol , $C_6H_{12}O_6$

* Transport via transport proteins [channel - Carrier].

[1] Polar molecules and Ions generally

e.g :- Ions [Na^+, K^+, Cl^-, H_3O^+].

[2] Large substanes

Note Aquaporins ايش هاد ؟؟

* Channel protein

آده ايش يعمل ؟

* the Passage of water molecules through the membrane in certain cell.

* each aquaporins allows [تسمح] entery of upto 3 bilion water molecule per seconed.

* تذكروا هاد وخزنو بمخك حتوجع بعدين نكمل قصتو

- 2 type of transport :-

① Passive transport ② Active transport.

→ Passive :- transport of materials down Concentration gradient without consuming energy.

- 3 type of passive transport :-

1) Diffusion 2) Osmosis 3) Facilited diffusion

"تذكر يا قطاعة" Solution ≡ Solute + Solvent.

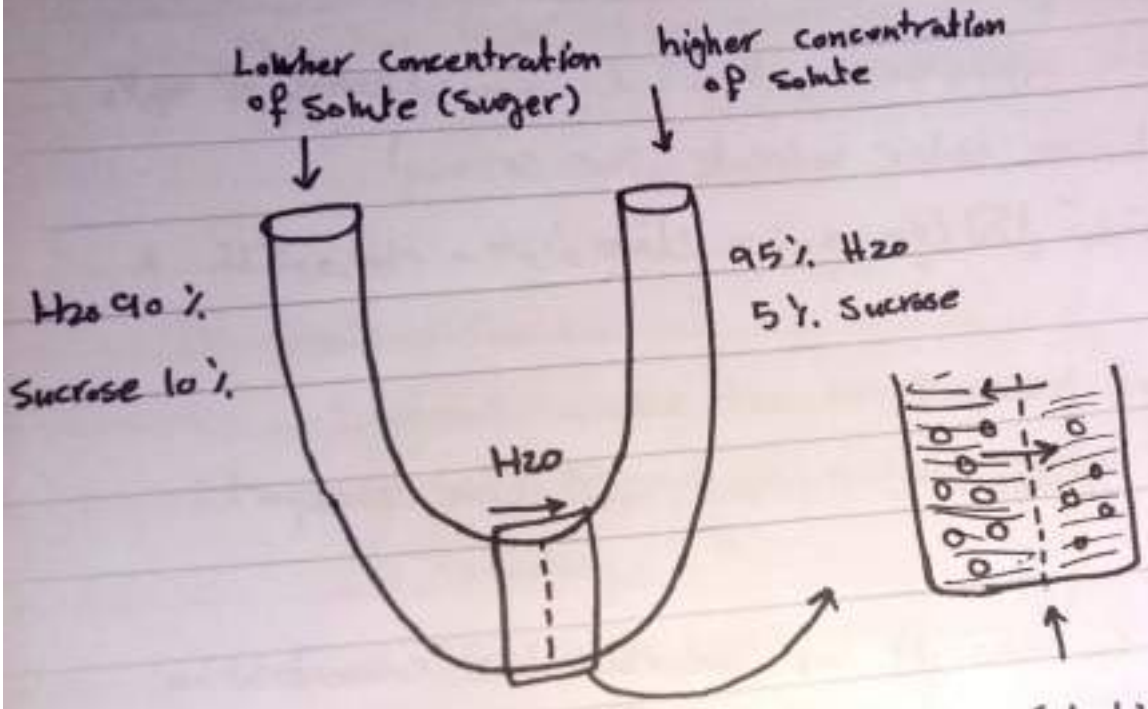
→ Diffusion.

the spontenous morment of **Solute** molecule down concentration gradient, without transport protein and without consuming energy

Ex:- Co_2 & O_2

→ Osmosis

net movment of **Solvent** (H_2O) molecules down concentration [Solvent H_2O] gradient without transport Protein, without consuming energy ; across semi [Selective] permeable membrane



Selective Permeble

* Water move from an area of higher to Lower free water concentration.

* 3 type of Solutions according to tonicity (≡ Solute)

1) ISotonic Solution
2) hypotonic Solution
3) hypertonic Solution.

→ Isotonic Solution.

Solution that has [Solute] equal to that of the cell.

e.g: normal saline ; 0.9% Nacl [محلول ملحي]

→ hypotonic Solution.

Solution that has [Solute] lower than that of the cell.

e.g: D.W [ماء مقطر] . Nacl < 0.9%

→ hypertonic Solution.

Solution that has [Solute] higher than that of the cell.

e.g: Nacl > 0.9%

* Water (H_2O) Balance in Animal cell.

Example :- Red blood cell (R.B.C).

- In Isotonic :-

1. No osmosis
2. the cell Stay Normall.

- In hypotonic :-

1. the cell will gain H_2O
2. the cell will Swell
3. the cell will lysis [bursting].

- In hypertonic :-

1. The cell will lose H_2O
2. The cell will Shrink [shriveled].

* water (H_2O) balance in plant cell.

- In Isotonic :-
  1. No osmosis
  2. No trigidity
  3. No swelling
  4. The plant become wilt [flaccid].
- In hypotonic :-
  1. The cell will gain H_2O by osmosis.
  2. The cell will swell but not burst.
  3. The cell will become turgid.
  4. The turgidity will make plant healthy [erect] [firm].
- In hypertonic :-
  1. The cell will los H_2O by osmosis.
  2. The cell will die is called plasolysis.

→ Facilited diffusion.
- is a type of passive transport.
- using transport protein → channels
  → Carrier

* Channel protein

Provide carridors that allow specific molecule or ions to cross the membrane.

* channel proteins that transport ions function as gated channels which open and close in respone to a stimulus.

مثال: بعض انواع gated channels تستجيب مثل الخلايا العصبية

↳ In nerve cell ; an ione channel open in response to an electrical stimulus

→ Allowing a stream of Potassium ions to Leave the cell.

* تذكر لما حكيتلك عن الـ Aquaporins اجا حدد لنقل وهتو :-

→ the water channel protein.

→ Facilite the massive amount of diffusion.

→ occur in plant cell and in animal cell.

* Carrier protein .

- such as the Glucose transporty.
- Involved in a facilited diffusion result in the net movment of a substance down it's concentration gradient.
- is passive transport.

يلا صحصح معاي يا شاطر

شوي وبتخلص 😂

2) Active transport

- the transport substances up (againt) concentration using transport energy.
- the cell must expend energy.
- have 2 type:

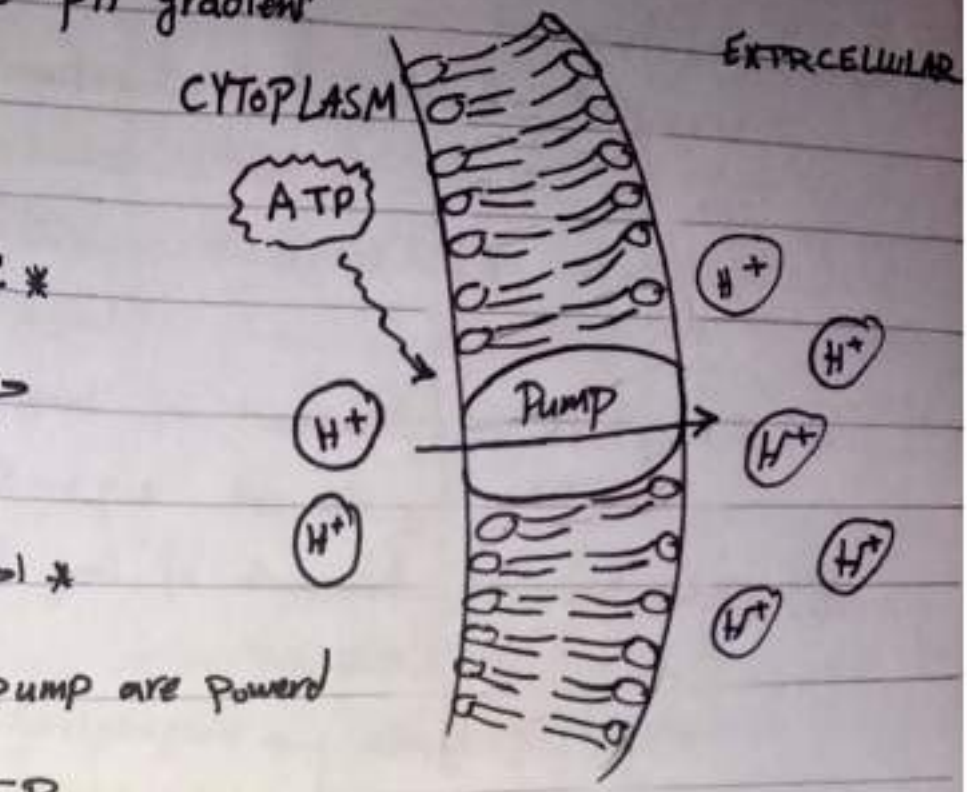
II Pumps.

* Na^+ / K^+ Pumps.
  - Located in animal cell.
  - has much higher concentration of (k^+) and a much lower concentration of (Na^+) so it transport $3Na^+$ outside and $2k^+$ inside.
  - it generates unqual distributin of ions across the membrane . توزيع غير متساوٍ للشحنات
  - two force drive the diffusion of ionas acess membran 1. chemical force 2. electrical force.
  - it gererabes electrochemical gradient
  - it estabilished voltage [membran potential]
    => -70 Voltage.

* H^+ Pump [proton pump].

- In all cell - transport protein
- it generate unqual electrochemical
- it generate voltage [membran potential].

- It generate pH gradient



* لما تطلع الـ H^+ للـ E.C.M

PH ↓ ، acidic حيصير

* اما الـ cytoplasm حيكون PH ↑

- most proton pump are powerd by ATP

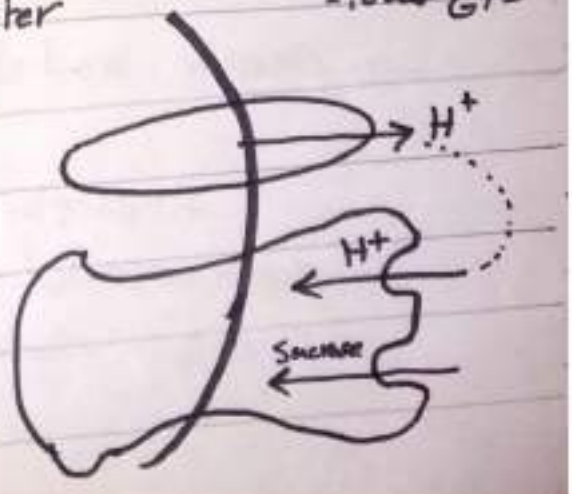
Note :- any pump that can generate voltage is called electrogentic pump.

2/ Cortansport.

- Transport of 2 substances by consuming energy to transport only one substance

e.g :- H^+ - Sucrose cotransport in plant cell in plasma membrane ther is a protein called Contranspoter

توضيح للمثال :-



تعل ماديتين وحدة بس بتستهلك طاقة والثانية تكون جايتها طاقة بشكل غير مباشر من عملية نقل الأولى .

Bulk transport

- transport of Larg Bulk substances into or out of the cell.
- 2 type :- A) Exocytosis B) Endosytosis.

A) Exocytosis :- transport of larg Bulk material outside the cell e.g :- Secretion.

B) Endosytosis :- transport of Larg Bulk material inside the cell.

- 3 types
  - Phagocytosis
  - Pino cytosis
  - receptor mediated endosytosis.

→ Phagocytosis [البلعمة / البلع الخلوي]

* cell eating - cell engulfment
* endosytosis of Large bulk Solid material
* E.g :- W.b.c [خلايا الدم البيضاء] eating bacteria
  - ameba
  - Paramecium.

→ Pino cytosis :- cell drinking endocytosis of Large bulk Liquid [fluid] substances.

→ reseptor mediated :- endocytosis of Large bulk substances by using Protein reseptor.

-. reseptor are Located in regions on the cell membrane called Coated pits.

e.g :- cholestrol → LDL
                  → HDL

خلصنا شرح

Problem :-

1. what are the membrane structures that function in active transport .

a) Peripherel Proteins
b) Carbohydrates
c) cholesterol
d) cytoskeleton filaments.
e) integral Proteins.

2. what is the voltage across cell membranes called ?

a) water potential
b) chemical gradient
c) membran Potential
D) osmotic Potential
e) electro chemical gradient.

3. which process accounts for the movement of solids into some animal cells ?

a) active transport
b) facilited diffusion
c) diffusion
c) osmosis
e) Phagocytosis.

4. which of the following would move through the lipid bilayer of plasma membrane most rapidly ?

a) Co2
b) an amino acid
c) Glucose
d) K^+
e) Starch.

5. The kinds of molecules that pass through a cell membrane most easily are ?

a) Large and hydrophobic
b) Small and hydrophobic
c) Large polar molecules
c) Ionic
e) monosaccharides such as glucose.

6. which molecule is NOT part of the cell membrane?

a) Lipid
b) nuclic acid
c) Protein
d) Phosphat group.
e) Steroid.

7. which of the follwing statment is correct about diffusion?

a) it is very repid over long distances.
b) it requires an expenditure of energy by the cell.
c) it is a passive process
d) it occurs when molecules move from a region of lower concentration to one of higher concentration.
e) it requires integral proteins in the cell membrane.

8. Active transport

a) requires a protein carrier
b) moves a molecule against it's concentration gradient
c) requires a supply of energy.
d) All of these.

9. Pinocytosis is an example of ?
a) active transport
b) simple diffusion
c) exocytosis
d) endocytosis

10. plant show turgor pressure when
a) cells are losing water from their water vacuoles
b) cells contain vacuoles that are full of water
c) water is being used up in photosynthesis
d) water is being evaporated from the leaves.

11. The plasma membrane functions to ?
a) control the rate at which molecules cross the membrane
b) Protect the cell's structural integrity.
c) Play arole in cellular communication.
d) do all of the above.

12. if a cell is placed in a hypotonic solution ; which of the following will occur ?
a) salts will move into the cell from the surrounding solution
b) water will move into the cell from the surrounding solution
c) salts will move out of the cell into the surrounding solution
d) non of these will occur.

13. The movement of molecules against a concentration gradients is called :-

a) Facilited transport
b) diffusion
c) active transport
d) osmosis.

14. The two major components of the plasma membrane are:

a) lipid and protein
b) lipid and carbohydrates
c) protein and Nucleic acid
d) protein and carbohydrates

15. If cell is plased in a hypertonic Solution, which will occur

a) salts will move into the cell from the surrounding Solution
b) Salts will move out the cell into the surrounding Solution
c) water will move out of the cell into the surrounding Solution
d) water will move into the cell from the surrounding Solution.

* عزيزي الطالبة :- ادعي لي في الكتاب وادرسهم متبع ^^

♡ "لا تبعد نظرك عن حلمك حتى يتحقق"

THE END

Cellular respiration

catabolic : هدم
Anaerobic : لاهوائي
Fermentation : التخمير
break down : تكسير
Exergonic : لمارد الطاقة
spontaneous : تلقائي
redox procsses : تفاعلات التأكسد والإختزال
oxidation : تأكسد
doner : معطي
acceptor : مستقبل
degree : درجة
sharing : يشاوك
reduction : إختزال
degradation : إنحلال
pyruvate : ملح من حمض البروفيات
converte : تحول
Carried : حَمَل/نَقَل
removal : إزالة

regenerate : يتجدد/يتطور
displaced : أزاحَ
Series : سلسة
embadded : رسَخ/غرس
passage : مرور/عبور
Couples : زوج
flow : تدفق
accumulate : تجمع
estabilish : تثبيت
Matrix : حشوة
Efficiency : كفاءة/فعالية
Biosynthesis : تأليف حيوي
absence : إنعدام/فقدان
yeast : خميرة
fungi : فطريات
fatigue : تعب/إجهاد
brewing : الخمر
baking : خبز
winmaking : عمل النبيذ

- In this chapter we will take 3 catabolic processes :
  1. celluler respiration.
  2. Anaerobic respiration.
  3. Fermentation.

A

→ : Celluler respiration :

- the process occurre in animal cell in Mitochondria.
- that meain : Complete breakdown of glucose into CO_2 in the presence of O_2.
- catabolic process , spontaneous , exergonic
- Exergonic ≡ release energy.
  $\Delta G = -686$ kcl glucose.

- Redox reaction : oxidation and Reduction.

* redox rection → is atransfer of one or more electron from one rectant to anthor , or transfer of electron doner to electron acceptor.

oxidation
loss of electrons from one substance.

reduction
addation of electron from one substance

Loss electron (oxidized)

Ex 1 $Na + Cl \longrightarrow Na^+ + Cl^-$

gains electron (reduced).

reduced

Ex 2 $C_6H_{12}O_6 + 6O_2 \longrightarrow 6CO_2 + 6H_2O + 686\ Kcal.$

oxidation

note: ↳ Transfer of 'H' from glucose 'O₂'.

Note not all redox reactions involve the complete transfer of electron from one to anthor substans, Some change the degree of electron sharing in Covelnt bond.

- redox reaction in the cell reactive (dehydragenase) that required a Conzyme called NAD⁺.

NAD⁺: nicotineotide adenine dinucleotide.

ينتزع الـ H من جزيئي ويمنحه لجزيء آخر [هذا معلم يعطي أوامر بهذا]

- NAD⁺ ≡ oxidized form: شكل التاكسد
- NADH ≡ reduced form: شكل الإختزال

$C_6H_{12}O_6 \xrightarrow{\text{dehydrogenase}} 6CO_2.$

$H_2O \xrightarrow{NAD^+ \rightleftharpoons NADH} O_2.$

* Celluler resbiration is a catabolic pathway that include 3 stage :-

1. Glycolysis 2. Krebs Cycle [حلقة كربس]

3. Electron Transport chain [سلسلة نقل الإلكترونات]

→ Glycolysis :

- occur in Cytosol ≡ [cytoplasm].
- the catabolic pathway that break down glucose and other organic fules.
- begin the degradation process by breaking glucose into two molecule of a compound called pyravate.
- Exergonic : release 2 ATP.
- Not aerobic , Not anaerobic .

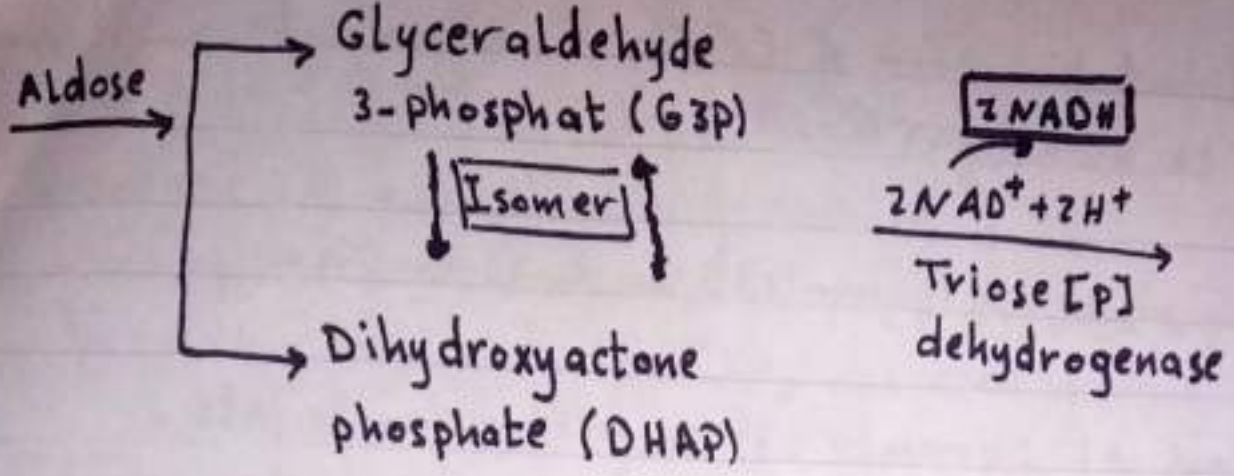
$$\text{Glucose} \xrightarrow[2NAD^+ \rightarrow 2NADH]{2ADP \rightarrow 2ATP} 2 \text{ pyrovate.}$$

- 10 reaction pathway [تتكون من عشر خطوات]

glucose $\xrightarrow[\text{Hexokinase}]{ATP \rightarrow ADP}$ glucose 6-phosphat $\xrightarrow[\text{isomer}]{\text{phosphoglucose}}$

→ Fructose 6-phosphate $\xrightarrow[\text{phospho-fructose}]{ATP \rightarrow ADP}$ Fructose 1-6 bisphosphate $\xrightarrow{\text{Aldose}}$

⇒



→ 1,3-Bisphospho glycerate $\xrightarrow{2ADP \rightarrow 2ATP}$ (phospho-glyceroKinase) 3-phosphoglycerate →

→ phospho-glyceromutes 2-phospho glycerate $\xrightarrow{Eolose}$ (H_2O) phosphonel pyruvate →

$\xrightarrow{2ADP \rightarrow 2ATP}$ (pyravate Kinase) pyravate .

- Summary :

Input	out put
Glucose C_6	2 pyrovate C_3
$2NAD^+$	2 NAD H
2ADP	2 ATP

* 2 ATP produced during glycolysis are produce by substrate-level phosphorylation (SLP).

- SLP: direct transfer of [P] from molecule to ADP to make ATP.

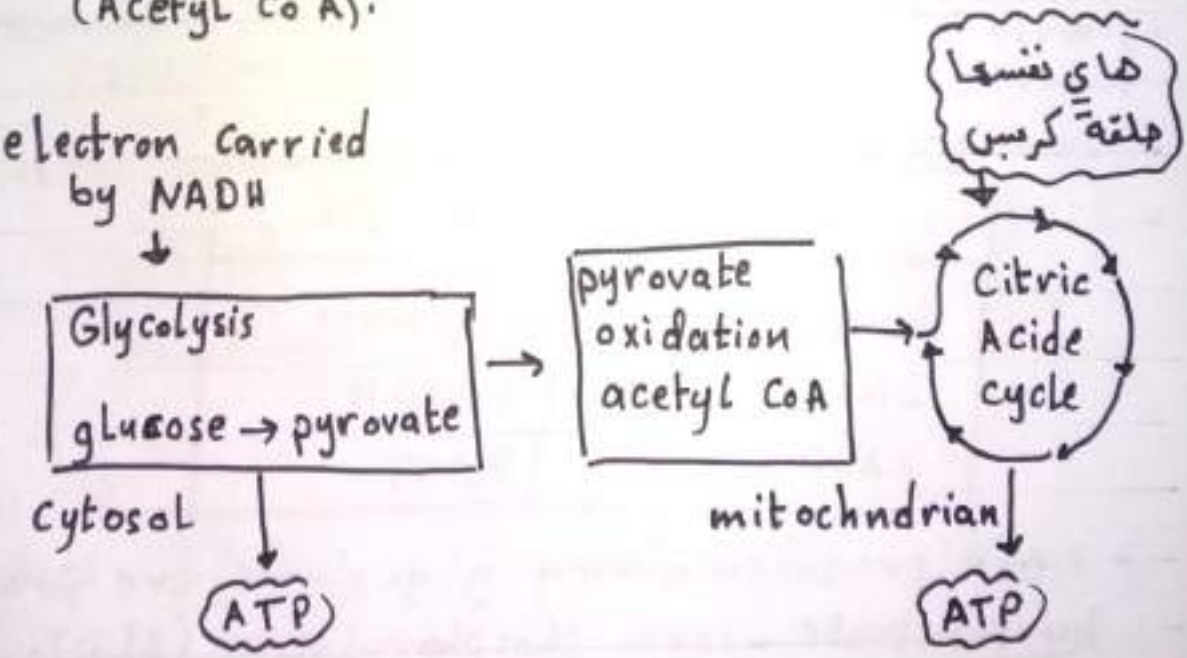
* الآن بعد ما صار عنا (pyrovate) رح يصير لو

Oxidation of pyrovate: it convert pyrovate into acytyle Co A that can enter Krebs Cyclic.

2 pyruvate $\xrightarrow[2\,NAD^+ \rightarrow 2\,NADH]{2\,CoA \rightarrow 2\,CO_2}$ 2 Actel Co A.

- occur in EuKaryote cell [Mitochandria].
- occur in proKaryote cell [cytosol].

* يدخل الغلوكوز حلقة كربس على شكل مركب ثنائي الكربون: (Acetyl Co A).



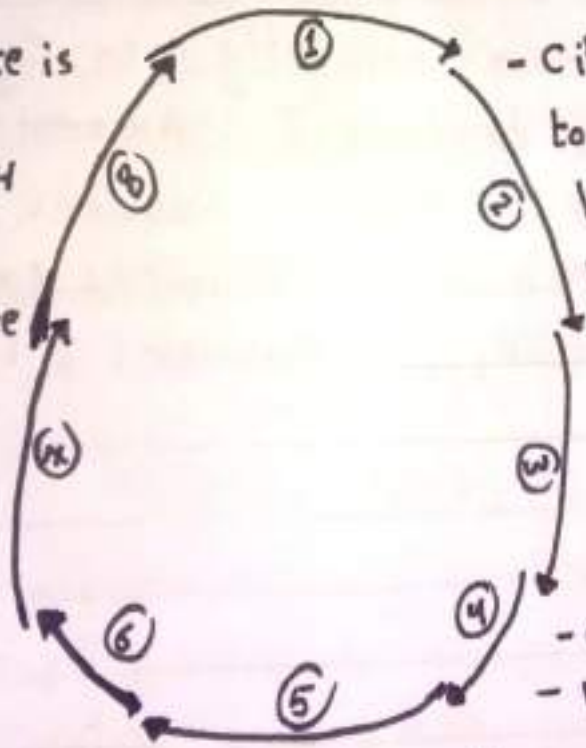
→ Krebs Cycle [≡ Tricarboxylic acide cycle].
[≡ Citric Acide cycle].

- occure in mitochondrial Matrix.
- the pyravate is broken down to 3 Co_2 molecule, inculding the molecule of Co_2 released during the Conversion of pyruvate to Acetyl Co A.

Note pyruvate ⇒ 2 molecules Glucose Convarte to Co A + 2 Co_2.

- aerobic , - 8 reaction cyclic pathway.
- Cycle : it start and ends with the Same molecule [oxaloacetic acid [C_4] {OAA}].

{acetyle CoA adds (Co A-SH) producing citrat



- The substrate is oxidized
- $NAD^+ \rightarrow NADH$
- regenerated oxaloacetate

- Citrate in Converted to Isomer (isocitrate) by removal of one H_2O and addition else

- addition of H_2O rearranges bonds in the Substrate

-isocitrate is oxidized, reducing NAD^+ to NADH, Loses a Co_2.

- transferd FAD → FADH

- anther Co_2 is lost
- reducing NAD^+ to NADH

- CoA is displaced by P group
- transferred GDP to GTP
- generate ATP.

* Citric acid ← OAA في Acytl CoA

C_6 ← C_4 + C_2 union

يلتحم ← [Fusion]

* Krebs Cycle per one glucose (2 turn).

input	out put
2 Acetyl CoA [C_2]	4 Co_2
6 NAD+	6 NADH
2 FAD	2 FADH
2 ADP	2 ATP

[Ex] Matose ⇒ [4 turn] ↘

ليش: لأنه يتكون من ↓ 2 Glucose → 4 Acetyl acids.

Function :. regeneration of OAA.

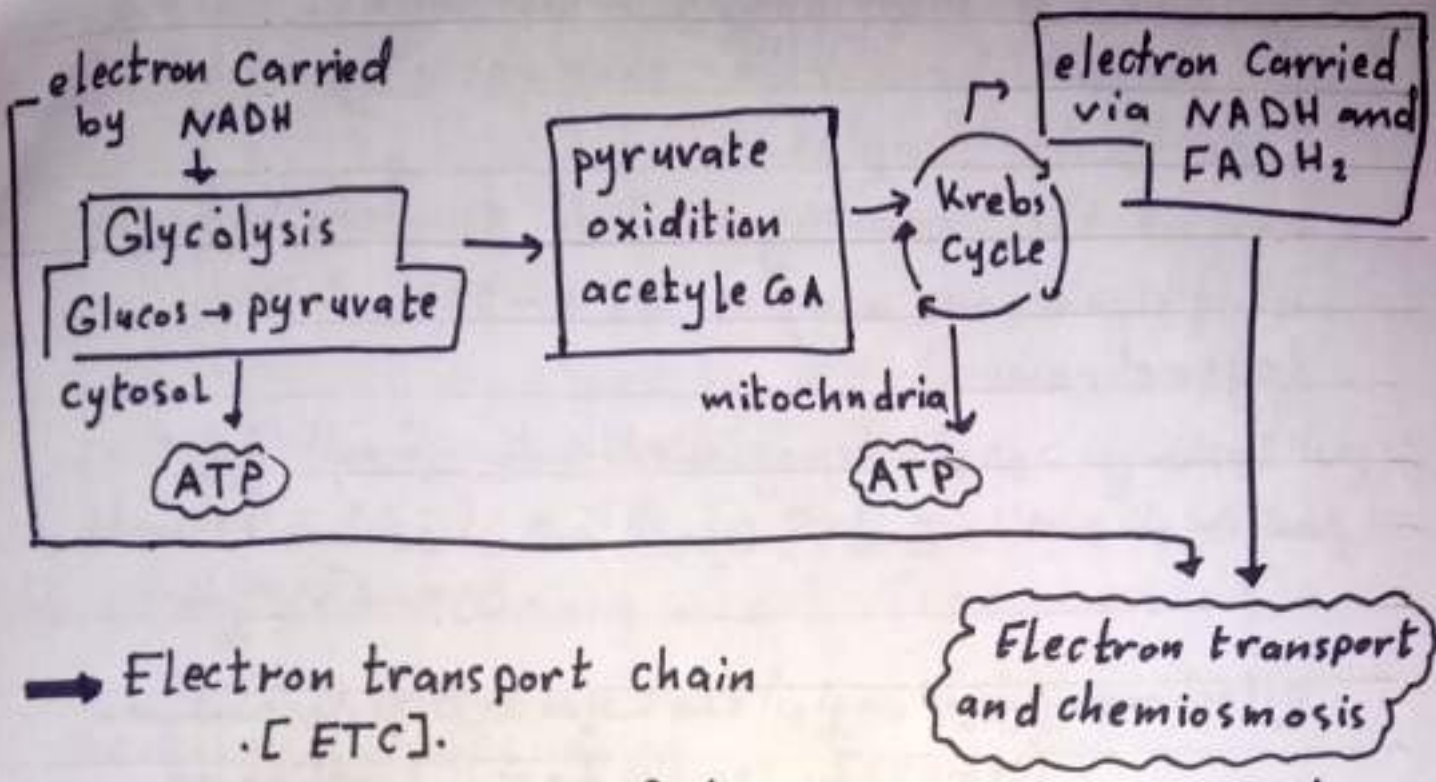
[Q] Glucose ⟶ completly into Co_2.

[1] How many Co_2 produce ? Answer: 6 Co_2

[2] How many ATP by SLP ? Answer: 4 ATP.

[3] How many NADH ? Answer: 10 NADH.

[4] How many $FADH_2$? Answer: 2 $FADH_2$.



➡ Electron transport chain .[ETC].

- is collection [series] of electron Carrier molecules embedded in the inner membrane of the mitbchondrian in Eukaryotic Cell.
- These $\bar{e}$ Carrier molecules [≡ ETC molecules].

dived into → 4 protein Complex (Complex I, Complex II, Complex III complex IV).
→ Lipid / Coenzyme Q (CoQ).

- These ETC molecules vary in electrongative.
the passage of $\bar{e}$ through Complex I.
- هذا الـ $\bar{e}$ جاي من حلقة كربس من NADH transform NAD^+.
يسمى هذا الـ molucule بـ (Flavin molucule)(FMN).
ثم يتأكسد (FMN) ← Fe.S ← ثم ينتقل إلى $\bar{e}$ إلى ubiquinone.

- ubiquinone : is individually mobile within the membran rther than residing in particular complex.

- most of the remaning electron Carriers between ubiquinone and oxygen are protein called (cytochromes.).

- هذا البروتين يشبه hemoglobin الموجود في خلايا الدم الحمراء لكن الفرق أن هذا البروتين يحمل e^- والهيموغلوبين يحمل الـ O_2 الاكسجين .

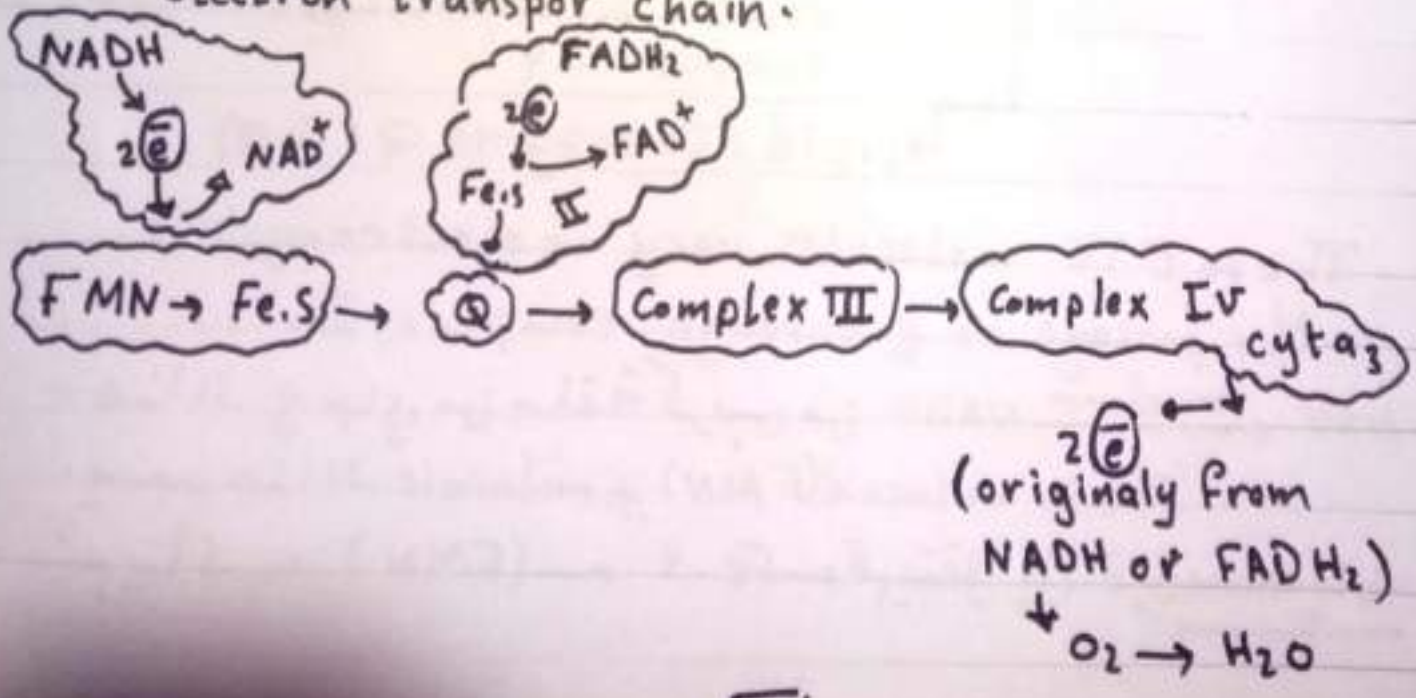
- سلسلة نقل الإلكترون لديها عدة أنواع من البروتين cytochromes ومسمياتهم (complex I, complex II --) .

- آخر نوع من البروتين في هذه السلسلة $cyta_3$ = passes it's electron t O_2

- الـ O_2 $\xleftarrow{\text{reduce}}$ H_2O

- الـ O_2 هو الـ (final $\bar{e}$ acceptor) لأنه عنده كهروسلبية عاليه .

Note NADH and $FADH_2$ oxidation provide $\bar{e}$ For electron transpor chain.



- As $\bar{e}$ flow in ETC molecule, they loss energy is used to make ATP by [oxidative phosphorlation] [o.p]
- Each NADH oxidized by FTC release energy- enough to make 2.5 ATP by o.p
- Each $FADH_2$ oxidized by FTC release energy- enough to make 1.5 ATP by o.p

⊛ chemiosmotic theory model [chemiosmosis].

- proposed by mitchel ⇝ اسم العالم
- It explain o.p in the cell.
- It links (couples) between the exergonic flow of electron in ETC AND ATP synthesis.
- As $\bar{e}$ flow in ETC, They relaese energy.
- This energy is used to pump H^+ [From matrix ⟶ inter-membrane space].
- H^+ accumulate in inter membrane space.
- They will established proten-motive force.
- The force will drive flow of H^+ back from inter membran space ⟶ matrix.

* across protein complex called ATP synthesis that become active:

ADP + P $\xrightarrow[\text{ATP synthsis}]{\text{Active}}$ ATP.

* Summary:

stage	No. of ATP by slp	No. of reduce conzyme	No. of ATP by o.p chemosmosis	Total
Glycolysis	2 ATP	2 NADH	2 * 2.5 = 5 2 * 1.5 = 3 → why	5 OR 7
oxidation	0	2 NADH	2 * 2.5 = 5	5
Krebs cycle	2 ATP	6 NADH 2 $FADH_2$	6 * 2.5 = 15 2 * 1.5 = 3	20

- The answer of why?
  Depending of shuttle molecules (proteins).

$C_6H_{12}O_6 + 6O_2 \longrightarrow 6Co_2 + 6H_2O + 30-32$ ATP

Efficiency: How much energy in glucose in Conversed to ATP. كمية الطاقة في الجلوكوز التي تتحول إلى ATP.

- Efficiency of cellular respiration = $\frac{30 \text{ ATP}}{686 \text{ kcal}} \times 100\%$

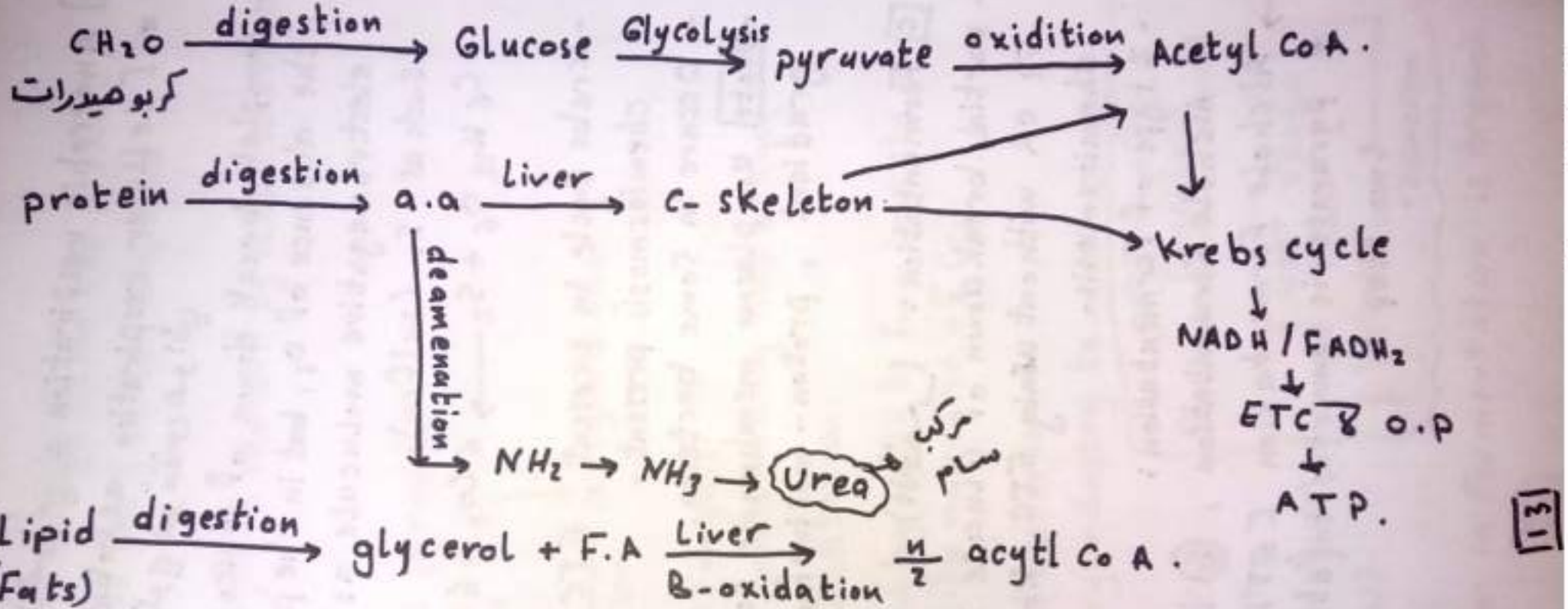
$= \frac{30 * 7.3}{686} \times 100\% = 34\%$ converted into ATP.

→ 66% Lost as Heat. ملاحظة: إذا واجهت أكبر أو أقل بشوي عادي بالأصل تتراوح بين 30-32

* Versatility of cellular respiration:

All food molecule Can enter Catabolic reaction of cellular respiration.

- Food → glucolysis → Krebs → NADH → ETC & o.p → ATP → → Energy Flow.
- Food $\xrightarrow{\bar{e}}$ glycolysis $\xrightarrow{\bar{e}}$ Krebs $\xrightarrow{\bar{e}}$ ETC $\xrightarrow{\bar{e}}$ $O_2 \longrightarrow H_2O$.



13

⇒ Biosynthesis : using a molecule of cell respiration in the anabolic synthsis of Biological molecule.

Scanned by CamScanner

* [B] Anaerobic respiration : التنفس اللاهوائي

* [Celluler respiration aerobic respiration]
التنفس الخلوي هو تنفس هوائي

- Complete break down of Glucose into ATP in the absence of O_2, but in the presence of anthor electronegative molucule as final $\bar{e}$ acceptor such as S_2 (sulfer).

$$C_6H_{12}O_6 + S_2 \longrightarrow 6\,Co_2 + 6\,H_2S + (30/32)ATP.$$

- Krebs Cycle in present, ETC & o.p present, chemiosmosis present.
- Occure in some bacteria.
- [Note] Use plasma membrane to generate pH gradient, proton-motive force.

* [C] Fermentation : (التخمير)

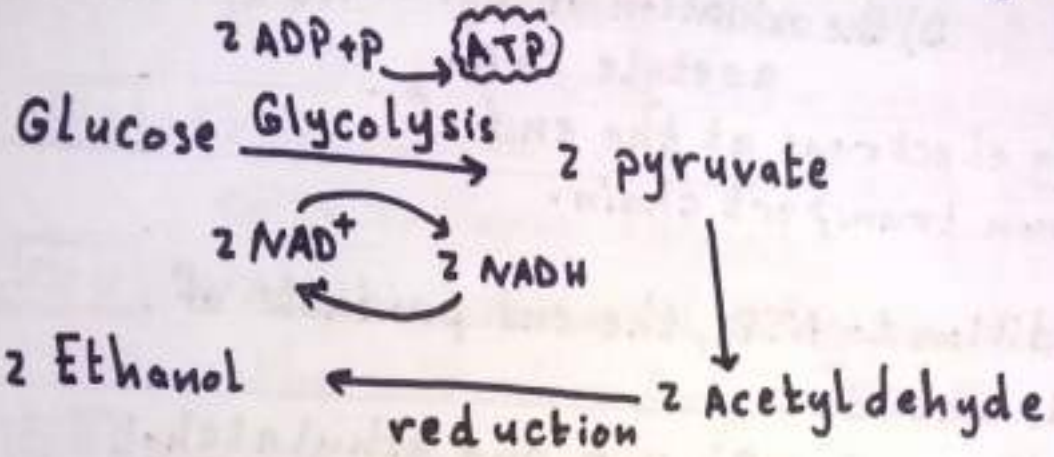
- partial break down of Glucose in the obsence of O_2 oR without using ETC, krebs, o.p and chemiosmosis.
- 2 type of Fermentation :
  ⓐ Alchole fermentation, ⓑ Lactate Fermentation.

→ Alchole Fermentation [EThanol fermentation].

* pyravate is Converted to (ethanol) alchole (EThyl) in two Step :

step 1: relese Carbon dioxide from the pyrovate, whice is Converted to the 2 Carbon Compound acetaldehyde.

step 2: acetaldehyde is reduced by NADH to ethanol.



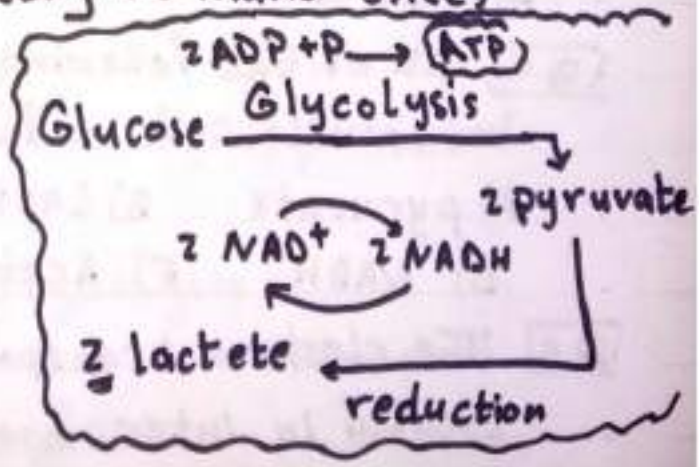
- occure in yeast (a fungus).
- used in brewing, winemaking and baking.

→ Lactic acid fermantation:

- pyruvate is reduced by NADH to form lactete as an end product, with no relese of Co_2.
- occur in fungi and bacteria.

* is used inthe dairy industry to make chees and yogurt.

- occur in mucle cell during excessive exercies, Lactate commulate in mucle → mucle pain (fatigue).



Note Final ē acceptor in Fermentation is organic.

problem

Q1 oxygen Consumed during cellular respiriation is directly involved in :

A) the Citric acid B) the phosphorylation ATP.

c) glycolysis D) the oxidation of pyruvate to acetyle co A.

E) accepting electrons at the end of the electron transport chain.

Q2 In addition to ATP, the end products of glycolysis include :

A) Co_2 and H_2O B) H_2O and ethylalchol

c) NADH and pyruvate D) Co_2 and ethel alchol

E) Co_2 and NADH.

Q3 During Aerobic represintation, electron travel down hill in which of the following:

A) food ⟶ NADH ⟶ ETC → O_2

B) glucose → ATP → O_2

c) food → glycolysis → Krebs Cycle → NADH → ATP.

D) food → H^+ ⟶ NADH → ATP.

Q4 All of the following substances are produces in amucle cell under anerobic conditions [redacted] except:

A) pyruvate B) lactose C) ATP

D) NADH E) Acetyl Co A.

Q5 The electron transport chain components are located in inter membrane space of mitochandri : T / f.

Q6 to general mechanisms by which Certain cell can oxidize organic and generate ATP withowt the use of oxygen:

A) anerobic respiriation and Fermentation

B) glycolysis and FTC c) o.p and FTC.

D) o.p and Fermentation.

Q7 Fermentation only occurs in proKaryotic cells to form ethenol: T/F.

Q8 NADH is produced only in the mitochondria: T/F.

Q9 which statment is not Cornect about redox reaction:-

A) molucule is reduced if it loses electrons.

B) molucule is oxidized if it loses electrons.

c) An electron doner is Called areducing agent.

D) An electron acceptor is Called oxidizing agent.

Q10 in the obsence of oxygen, Yest cells Can obtain energy by fermentation and production of ATP, Co_2 and Lactate: T/F.

Q11 which process in Fukaryotic cells will normally proceed whether O_2 is present or obsents?

A) Fermentation B) glycolysis.

c) Krebs cycle D) electron transport.

E) oxiditive phosphorylation.

CH(11) :- Photosynthesis.

- Captured : تمسك
- Spactrum : طيف
- Wave length : طول الموجي
- Violet : بنفسجي
- Indigo : نيلي
- Pigment : اصباغ
- Fixing / Anchoring : تثبيت
- Absorbtion : امتصاص
- Strike : تصادم
- Photoexcited : تنشيط
- Spiliting : فصل
- unstable : غير مستقرة
- transmitting : نقل
- Regeneration : تجديد
- reflecting : انعكاس
- accumulate : تجمع, تراكم

Heterotrophs: unable to make their own food. They live on compound produced by other organisms.

- are the biosphere's consumers

- All heterotrophs, including humans are completly dependant, either directly or indirectly on photoautrophs for food and O2 by product of photosynthesis.

Chloroplasts: The Site of photosynthesis in plant

- All green of plant have chloroplast, but the leaves are the major sites of photosynthesis in most plant

- Chloroplasts are found mainly in the cells of the masophyll

"The tissue in the interior of" ← عبارة عن
the leaf"

- CO_2 enters the leaf and O_2 exist by Stomata (microscopic pores)

- Chloroplast have 2 membranes surrounding adense fluid called (The Storma)

- Suspended within the storma is a third membrane system, made up of sacs called "thylakoids"

note: الجذور هي المسئولة عن نقل الماء (roots) وينتقل الى
عن نقل نفيه الى (vein) الذي سيتغذى (leaves)
to export sugar to root and other non photosynthetic parts of the plant

"Photosynthetic process."

→ Photosynthesis: The process of converting light energy captured by chloroplasts into chemical energy stored in food and other organic molecules.

* occur in plant and algae
* Endergonic $\Delta G > 0$
* non - spontaneous
* Anabolic
* redox process

→ An organism acquires [ ] the organic compound it uses for energy by one of 2 major modes:

① Autotrophic
② Heterotrophic

Autotrophic: The sustain themselves without eating anything derived from other living beings.

* are the biosphere's producers.
* All plants are autotrophs

→ The only nutrients they receive are water and minerals from the soil and CO_2 from air.

→ Plants are photoautotrophs

↳ organism that use light as a source of energy to synthesize organic substances

* Thylakoid Sacs are stacked in columns called grana

* Chlorophyll. The green pigment that gives leaves their color.

→ It's the light energy absorbed by chlorophyll that drives the synthesis of organic molecules in the chloroplast.

→ Photo Synthesis Equation :-

$6CO_2 + 6H_2O + \text{light energy} \longrightarrow C_6H_{12}O_6 + 6O_2$

- Photo Synthesis as a redox process

$6CO_2 \xrightarrow{\text{reduced}} C_6H_{12}O_6$

$6H_2O \xrightarrow{\text{oxidized}} 6O_2$

} Water is split and e^- are transferred H^+ from the water to carbon dioxide; reducing it to sugar.

. Light is a form of electromagnetic energy

- The colores we see as visible lingth include those wavelengths that:

drive photoSynthesis visible light = part of electro magnetic spachrum

travel as waves.

Wave length = distance between 2 waves (nm)

= composed from photones

= 380nm - 700nm

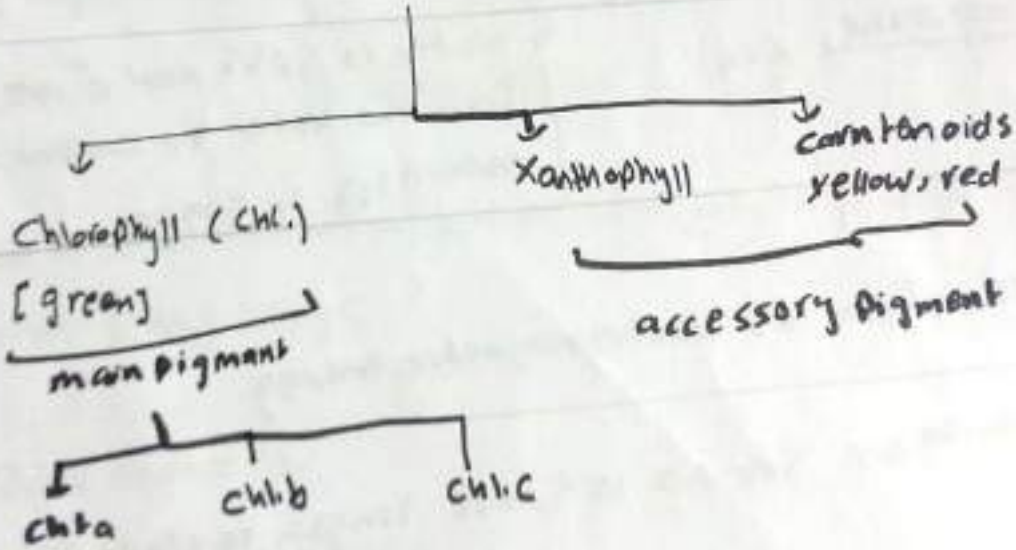
= composed from 7 colors of spectrum.

[violet, Indigo, Blue, green, yellow, orange]

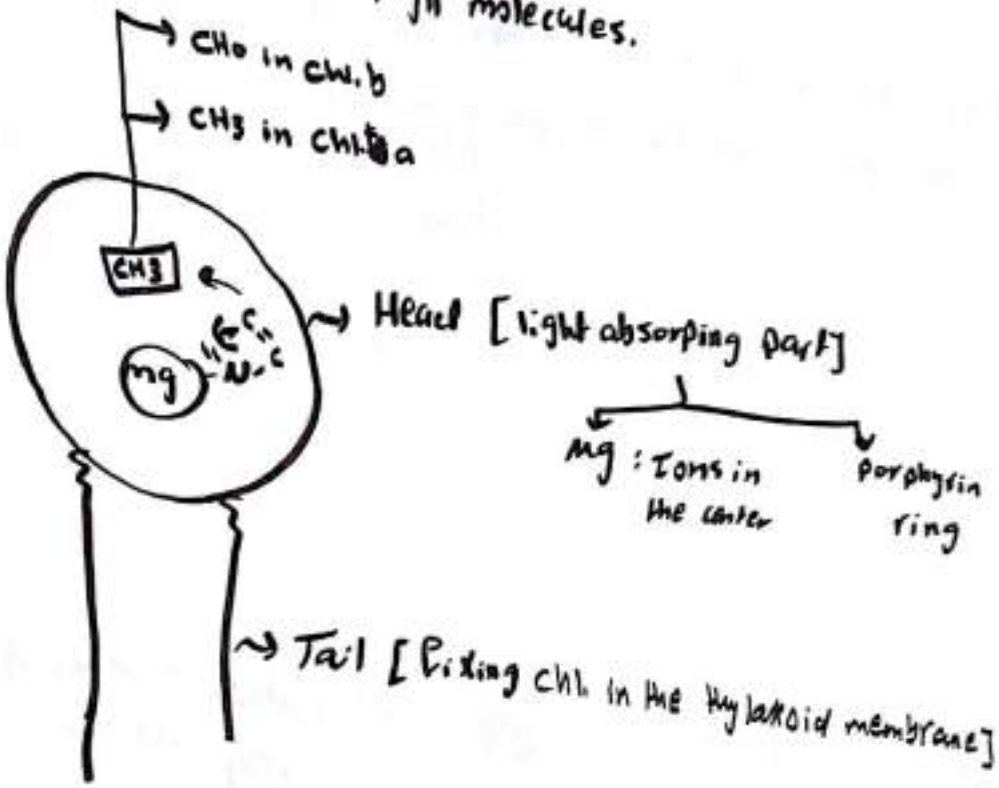
من كل لون (50nm) تقريباً.

- Pigment: any molecule that absorbed light

- Photo Synthetic Pigment : molecule that absorbed for synthesis



of Chlorophyll molecules.



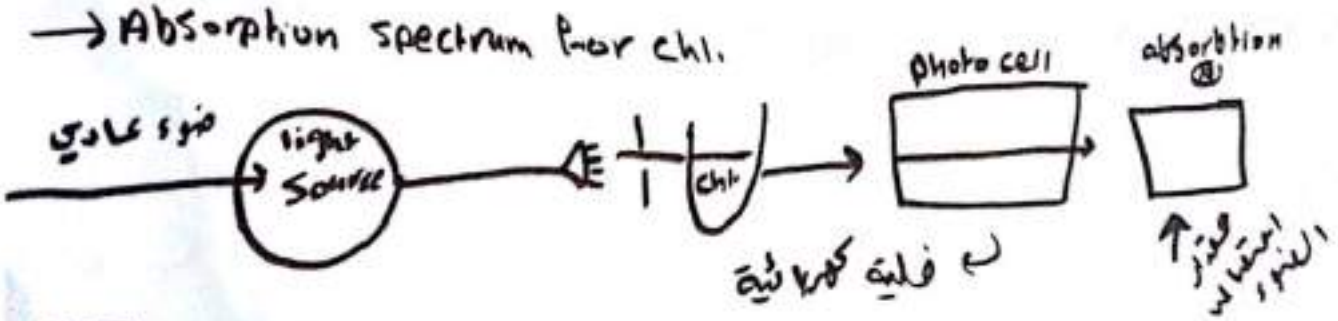
Note: Chl.a and Chl.b differ only in one of the functional group bonded to porphyrin ring.

⟹ Light absorption.

light photons hit (strike) $\bar{e}$ of chlorophyll so, its $\bar{e}$ become photoexcited (energized).

- The energized $\bar{e}$ become unstable (highly excited) so, Chl. will lose $\bar{e}$ and photosynthesis begin.

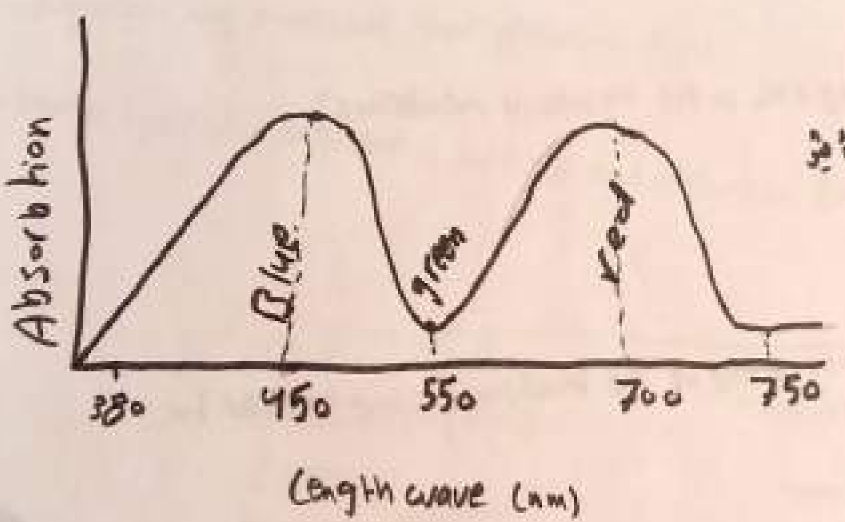
→ Absorption spectrum for chl.



→ The ability of pigment to absorb various ~~[crossed out]~~ wave length of life can be masurd with an instrum called Spectrophotometer.

↓↓

• جهاز يعمل على اختبار طول الموجة بحيث ان الجهاز يقيس درجة امتصاص اختبار لونه، يختار الرقم بالامتصاص



* الاحمر والازرق اكثر لونين تأثير على عملية البناء الضوئي

* اللون الاخضر لا يتم امتصاصه فينفذ عبر الورقة و يظهر اللون الاخضر.

* If a pigment is illuminated with white light, the color we see is the color most reflected or transmited by the pigment.

* we see green when we look at a leaf because chlorophyll absorbs violet-blue and red light, while transmitting and reflecting green light.

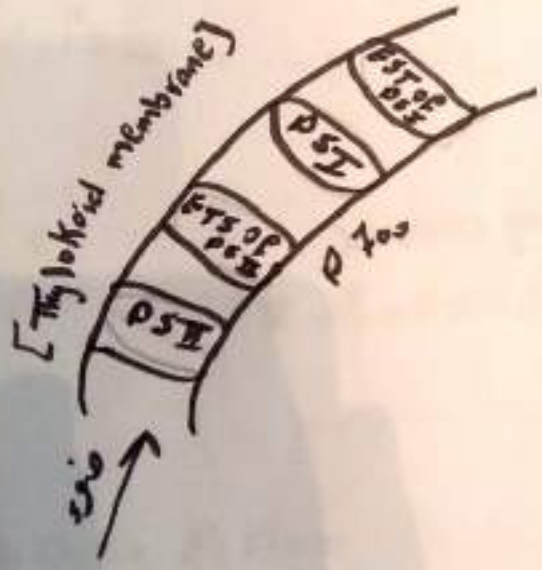
• Photosynthesis is diveded into 2 stage

A) light reaction

B) Dark reaction

⇒ reaction that convert captured light energy into ATP and NADH

- occure in thylakoid membrane
- Divided into → 2 sets of light capturing rxn called photosystem → PS I
  → PS II
  → 2 sets of ETC rxn → ETC of PS I
  → ETC of PS II.



- A pigment gose from a ground state to excited state when a photon of light boosts one of the pigment electrons to a higher energy orbital.
- This excited state is unstable, $\bar{e}$ from isolated pigment tend to fall back to the ground state, giving off heat / light.

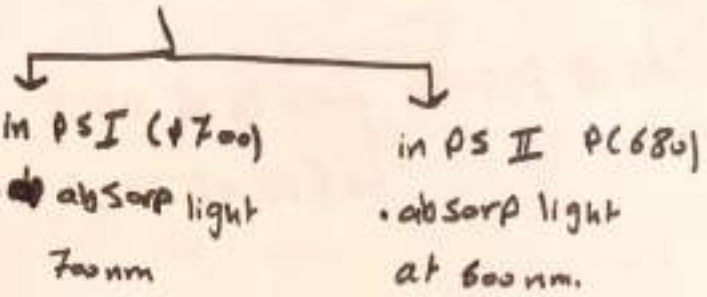
* A photosystem is composed:
  1) light harvesting complex
  2) rxn center complex
  3) primary $\bar{e}$ acceptor.

1) light harvesting Complex [Chl.a and Chl.b]

- act as antenna: connect [redacted] Concentrate light and send it to reaction-center

2) rxn-center Complex

- Composed from a pair of special Chl. a



⇝ Function:-

1. It recive high energy photon from light harvesting complex
2. It's $\bar{e}$ become photoxcited (energized)
3. primary $\bar{e}$ acceptor
   - Donate energized $\bar{e}$ to ETC
   [$\bar{e}$ escape from PS → ETC

* During light rxn 2 types of $\bar{e}$ flow:

1) linear $\bar{e}$ flow 2) non-linear flow.

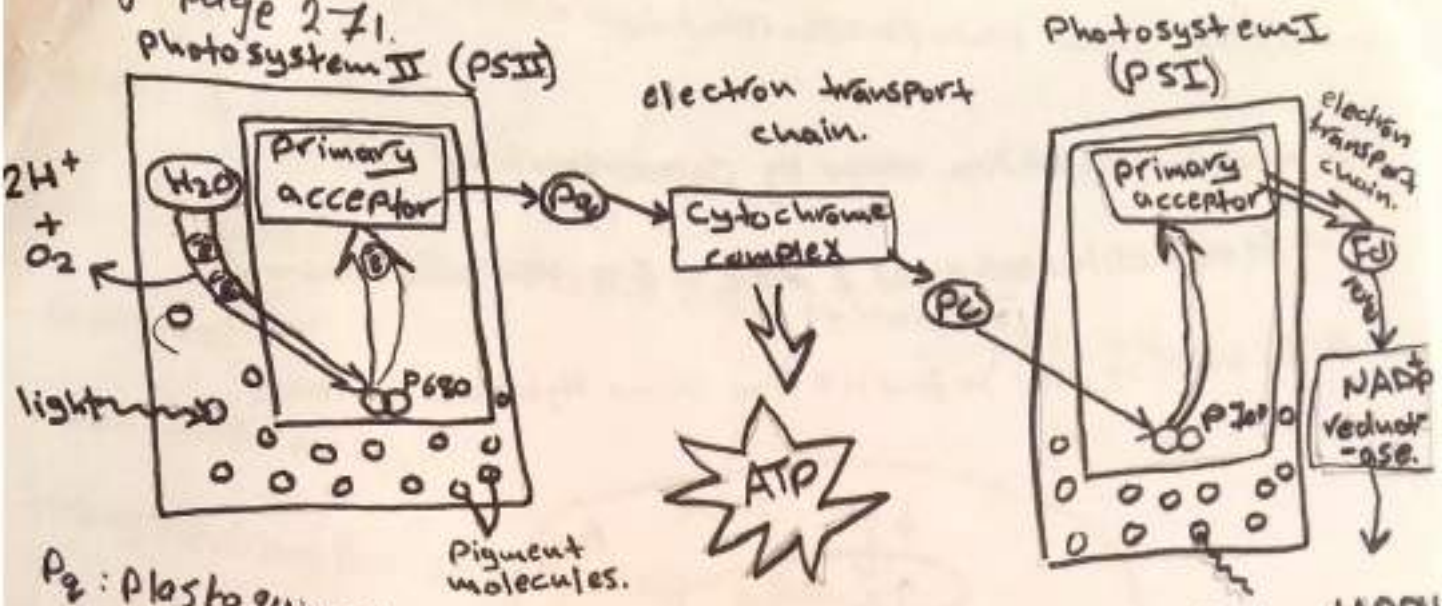
↳ occure in thylakoid membrane

it requires [depends على] on 2 PS (PSI, PS II) and 2 ETC

it oxidizes H_2O and release O_2.

• Function: production of ATP, NADH and O_2

Fig. Page 271.



Pq : Plastoquinone → electron carrier

Pc: Plastocyanin → Protein

Fd: Ferredoxin → Protein

ETc

* O_2 ↑

$H_2O \xrightarrow{e} PS\,II \xrightarrow{e} ETc \xrightarrow{e} PSI \longrightarrow ETc \longrightarrow NADP^+ \longrightarrow NADHp$

→ Cyclic $\bar{e}$ flow

- employs only 1 photo system
- occur in the thylakoid membrane

Function: production of ATP

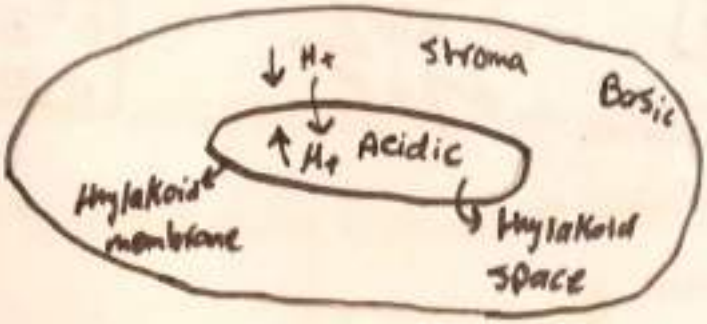
- The $\bar{e}$ cycle back from (Fd) to the cytochrome complex and form there continue on to P700 Chl. in PS I rxn-center complex
- No O_2 release
- No production NADPH
- No oxidation of H_2O

⟶ Non-linear photophosphorelation

Q: How phosphorelation occur by chemiosmosis?

→ As photo exited energized $\bar{e}$ move in ETC they lose energy

→ This energy is used to pump H^+ from Stroma thylakoid membrane.



* H^+ accumulate in thylakoid space generating H^+ motive force that will drive flow of H^+ back from thylakoid space ⟶ Stroma, accross ATP synthesis in thylakoid membrane

* ATP synthesis become active : ADP + P ⟶ ATP

Note: ATP and NADPH accumlate in Stroma ⟶ calvin cycle

- O Calve in Strome

- use the chemical energy of ATP and NADPH to reduce CO_2 to sugar

- Endergonic

- closely depend on light

- using electrons from NADPH and energy from ATP

- Anabolic, buleding carbohydrates from small molecule and consuming energy.

⇒ * Carbohydrate produced directly from the calvin cycle is a three-carbon sugar (glyceraldehyde 3-phosphate) [C3O]

* The Calvin cycle take 3 turn, fixing, 3 molecule of CO_2 one per turn of the cycle

* The cycle become it's start and end with the same molecule

[Ribulose biphosphate ≡ $RubpC_5$]

⇒ Function: CO_2 [inorganic] → CH_2O (organic Sugar)

* Calvin cycle is divel ito 3 Stages:

1. CO_2 fixation
2. Reduction phase
3. Regeneration of Rubp (CO_2 acceptor)

① CO_2 fixation

* The calvin cycle incorporates each CO_2 molecule by attaching it to five-Carbon sugar [ribulose bisphosphate (RuBP)].

* The Enzyme that catalyzes this step is RuBP carboxylase-oxygenase OR Rubisco.

* The product is a six-carbon
  ↳ is short lived, why?!
  - Because it is unstable that it is immediately splits in half, forming 2 molecule of 3-phosphoglycerate.

Summary -↑-

each 3 turn

$3\,RuBP + 3\,CO_2 \xrightarrow{\text{rubisco}} 3C_6$

② Reduction phase

- 3-phosphoglycerate + P → 1,3-bisphosphog-lycerate.

ADP + (P) = ATP يحصل على P من ال

- 1,3-bisphosphoglycerate reduced by ē donated from NADPH and loss P groub

6 G3P (sugar) ← comming

→ 3-carbon sugar.

→ 3-molecule of CO_2.

but only one molecule of 3-carbon sugar (1 G3P) Net yield (net gain).

*gegeneration of CO_2 acceptor.

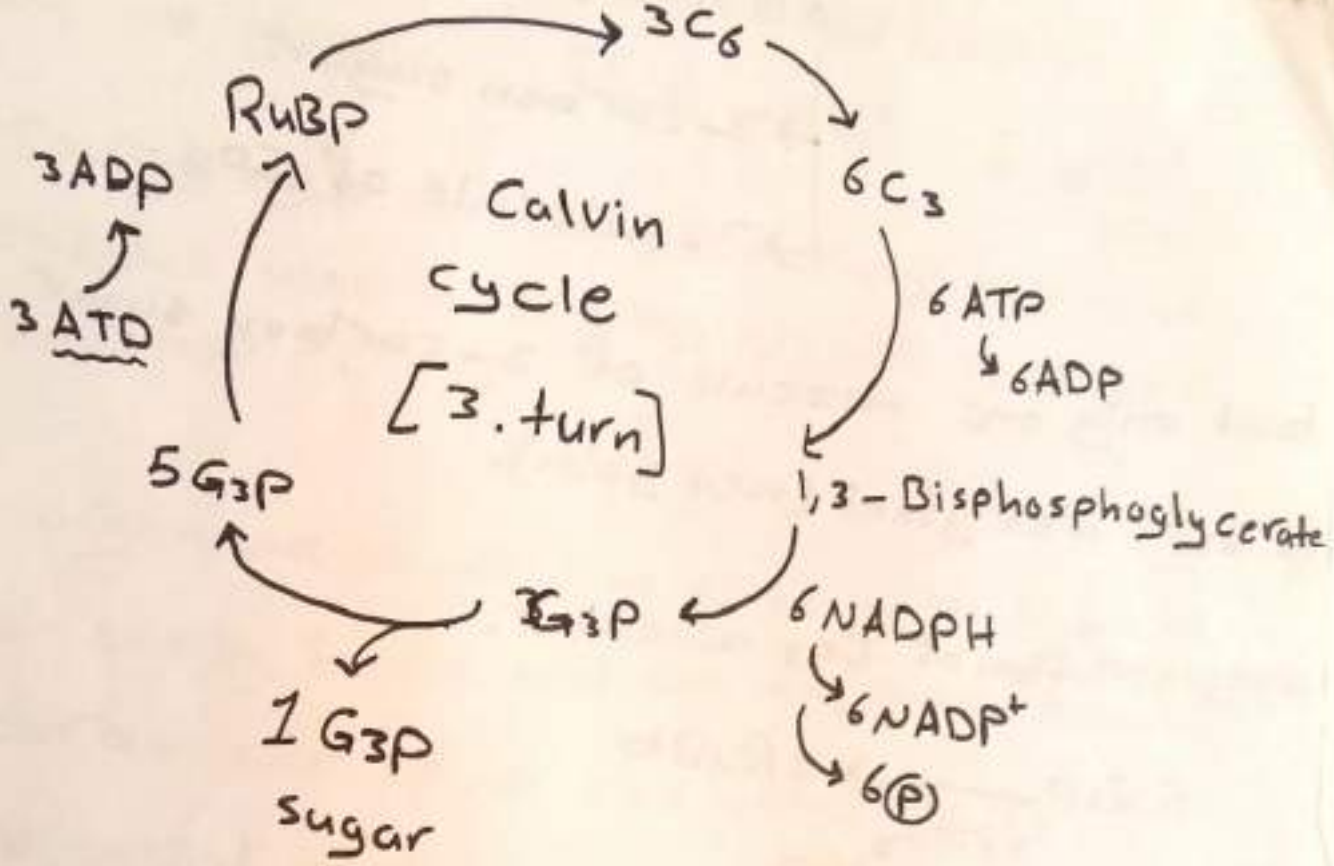
5 G3P ⟶ 3 RuBP

3 ATP ↘ 3 ADP

- 5 G3P are rearranged by the cycle spends 3 moleculs of ATP.

↓

into 3 RuBP.



input

6 CO_2
18 ATP
12 NADPH

output

2 G3P
18 ADP
12 $NADP^+$

Note

[6. turns]

↳ Calvin cycle for synthesis of 1 Glucose molecule.

Q::

⟹ To synthesize one glucose, the calvin cycle uses ..... molecule of CO_2 ..... molecule of ATP, and ..... molecule of NADPH.

Q1:: which of the following are products of the light reaction of photosynthesis that are atilized that calvin cycle ?!

A. H_2O and O_2

B. CO_2 and glucose.

C. ATP and NADPH

D. $\bar{e}$ and H^+

E. $NADP^+$ and ADP.P.

Q2:: During light reaction of photosynthesis, the enzyme used in reducing NADPH is NADPH reductase ?! T/F

Q3:: organisms that can exist with light as an energy source and one inorganic from of carbon and other raw materials ?!

A. are called photoautotrphs.

B. are called hetrerophs.

C. are best classified as decomposers.

D. don't exist in nature.

Q4:: more hydrogen ions are found within the thylakoid speace than in the stroma ?!

T/F

Q5:- The carbohydrate produced directly from the calvin cycle is actually not glucose, but a three-carbon sugar; the name of this sugare is ------.

Q6:- the two stage of photosynthesis are known as ?!

A. the synthesis part.
B. The photo part of Photosynthesis.
C. Calvincycle
D. light reaction
E. All of the bove.

Q7:- Carbon dioxide exits the leaf, and oxygen enters by the pores called stomata?! T/F

Q8:- I PS II absorped light at 700 nm ?! T/F

Q9:- The calvin cycle uses the chemical energy of ATP and NADPH to reduce CO_2 to sugar ?! T/F

Q10:- in photosynthesis as aredox process ?!

A. CO_2 becomes reduced to glucose.
B. glucose becomes reduced to CO_2.
C. CO_2 becomes oxidized to glucose.
D. glucose becomes oxidized to CO_2.

Chapter 12.

Mitosis :-

Division : انقسام
Identical : متطابق
Heredity : وراثة
offspring : نسل
Somatic Cells : خلايا جسمية
Reproductive Cells : خلايا تناسلية
Sperm : حيوان منوي
Eggs : بويضات
Diploid : ثنائي
Haploid : فردي
Duplication : تضاعف
Cohesion : تماسك
Significence : أهمية
Prophase : الطور الأولي
Prometa phase : بداية الطور الثاني
Meta phase : الطور الثاني
Ana phase : الطور الانفصالي
Telo phase : الطور الانتهائي
Hold : عقد / مسك
poles : قطب
Spindle : مغزلي
Condensed : تكثف
Fragments : قطع
Disappear : عدم ظهور
Shallow : سطحي
Groove : اخدود
Repair : إصلاح

Mitotic division : الانقسام المتساوي

- Cell division → Mitosis .
  → Meisis .

* Cell division is a part of the Cell cycle.
* most cell division results in genetically identical daughter cells.

⇒ Cellular organization of the genetic material

- DNA : genetic material molecule of heredity.
- Gene : Piece of DNA [Chromosome].

→ heredatery unit : وحدات وراثية

- Chromosome : DNA-protein Complex , Carry genes.
- Genome: Complete Complement of DNA in the Cell (genes).
- Chromatine : The Complex of DNA and protein.
- Heredity : Transfer of gene from parent to offspring

There are two type of Cells :-
* Somatic Cells.
* Reproductive Cells. (Gamete).

Somatic Cells :

- All body cells EXcept the reproductive Cells.
- Contain diploid number of Chromosome [2n = 46 Chromosome.]
- Chromosome Can be arranged as pairs Called ; homollogous chromo.
- e.g :- SKin , liVer , intestine , Zygote.

Reproductive Cells :

- Gamete - sperm and egg
- Have half as many Chromosome as somatic Cell.
- Haploid number (1n = 23 chromosome).

* بدنا نعرف كم معلومة حلوة ..

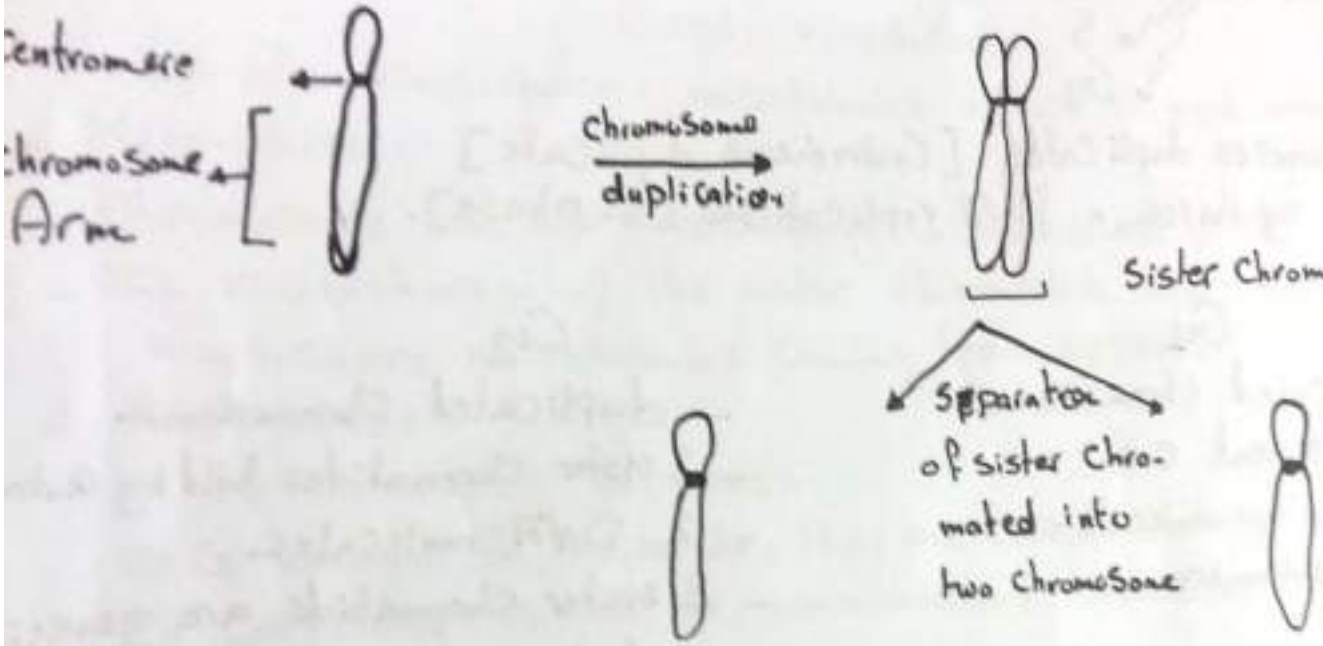
So, متضاعف الـ genetic material قبل الانقسام !

Chromosomes are duplicated.

⇒ Each on then Consists of two identical sister chromatides.

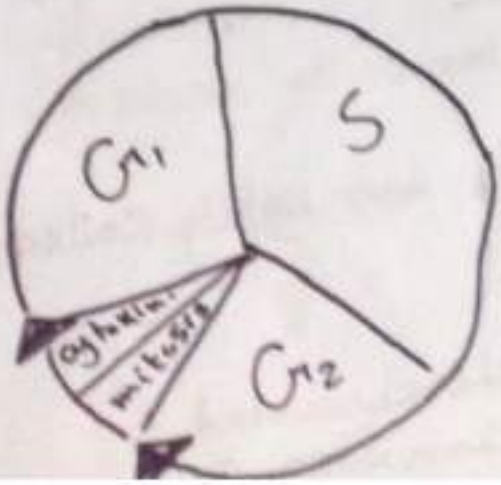
⇒ Sister Chromatides Connected along their lengths by Sister Chromatids Cohesion and held most tightly together at the Centromeres.

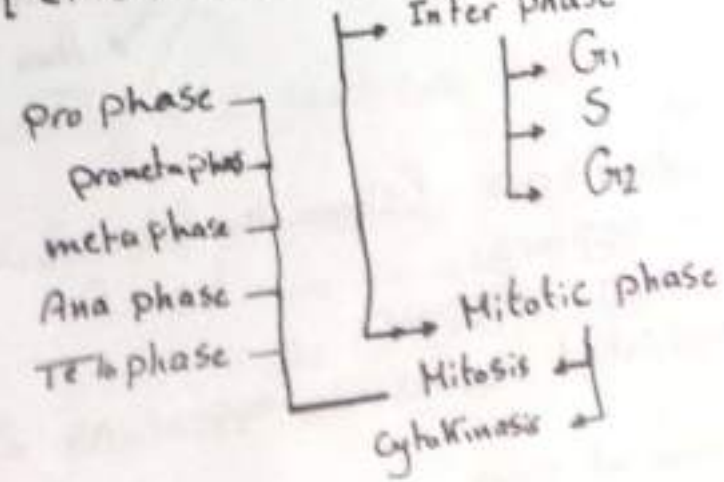
⇒ When Cohesion is broken, the chromatids separate during cell divis



Mitosis ⟶ Cell division that result in genetically identical daughter cell it's also significant stage in cell cycle.

Cell cycle :- Sequance of stage in which the cell duplicate it's DNA [Chromosome] of then it divides:





Note :- Muscle cells and nerve cells Never divide.
* Stope at G_{10}.

A :- Inter-phase
- preparation for mitosis.
- 3 subphase → G_1, S, G_2
- Organelles duplicates [Centrosome duplicate]
- DNA synthesis = DNA replication [S-phase].

G_1	G_2
- unduplicated chromosome.	- duplicated chromesome.
- one filament cell.	- 2 sister chromatides hold by centrom
- one DNA molecule.	- 2 DNA molecules.
- one centromere.	- 2 sister chromatids are genetic identical.

B :- M-phase
1. mitosis (Karyo Kinesis) → pro phase, prometa phase, meta phase, Ana phase, Telo phase.
2. CytoKinesis

Pro-phase :
- The spindle fibrous [chromatin fibers] became more tightly coiled and Aster appears.
- The nucleoli disappear.
- each duplicated chromosome appear as 2 sister chromated [Chromasone Condense]
- Centrosome at poles.

Prometa-phase :
- Nuclear envelop fragments.
- The Microtubules (spindle) extending from each centrosome.
- The chromosome have become even more condensed.

Two type of microtubules :.

1)- Kinetochore : Microtubules attached to Centromere via prot
Called; Kinetochore.

2)- Non-Kinetochore : microtubules attach to each other.

Meta-phase :
- Chromosome line up individually in metaphase plate.
- The kinetochores of the sister chromatide are attached to Kinetochore microtubules coming from opposite.

Ana-phase :
- Sister chromatids separate.
- once chromatide separate, they are called chromosome
- The cell elongates as the non kinetochore microtubules lengthen.

Telo-phase :
- unduplicated chromosome at poles.
- Nucleoli reappear.
- The chromosomes become less condensed.
- Mitosis, The division one nucleus into two genetically identical nucli

* Cytokinesis :-
- Cytoplasm division resulting in 2 genetically identical daughter cell

⇒ In animal Cell : By formation of cleavage furrow using Micro-filament ⇒ cleavage furrow, a shallow groove in the cell surface near the old metaphase plate.

⇒ In plant Cell : By formation of cell plate using vesicles from Golgi and ER.

Mitosis occur in Somatic cells ; Their function :-

1. Repair.
2. Reproduction (asexual).
3. development [zygote become multicellular embryo].

1 parent Cell (2n) —Mitosis→ 2 daughter Cell genetically identical (2n)

Called : Clones

2^n : number of mitotic / relting cells

$2^1 \rightarrow 2 \rightarrow 2^2 \rightarrow 4 \rightarrow 2^3 \rightarrow 8 \rightarrow \dots$

أول انقسام

ثاني انقسام

ثالث انقسام

Questions :-

1. What is the Correct order of the stage of mitosis?
   1. metaphase , 2. Teluphase , 3. Anaphase , 4. prophase

A- 4, 1, 2, 3
B- 2, 3, 1, 4
C- 4, 1, 3, 2
D- 1, 2, 3, 4

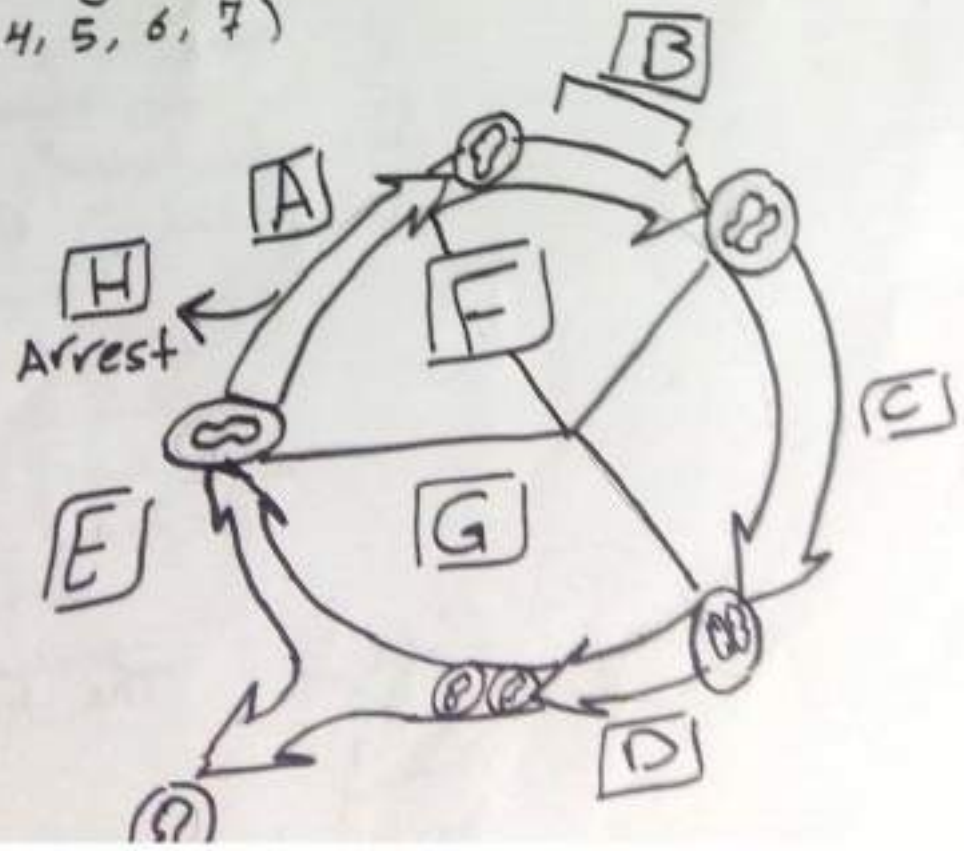
2. A Cell with 10 Chromosomes undergoes mitosis, After mitosis is finished, daygbter cell are created and each daughter cell has Chromosome : ?!

A- 2, 10
B- 10, 2
C- 2, 20
D- 1, 10

3. If a cell doesn't want to divide, it leaves the cycle enter-?

A- G_0
B- G_1
C- S-phase
D- G_2

Study the figure below and answer the questions that follow (4, 5, 6, 7)



4. Phase "A" is Called _____.
5. Phase "B" is Called_____, and one main event that happens during this phase is a _____.
6. The letter "H" refers to _____, two example of Cells arrested at "H" are _____. , _____.
7. The letter "E" refers to _____.
8. The length of normal human cell cycle IS : ?!
   A. 24 hours
   B. 48 hours
   C. 24-Mint
   D. 48-Min.
7. MiCrotubules attached to Centromere via antibodies Called Kineto Chore. T / F.
. A Shallow groove in the Cell surface near the old meta plate: ?
A. Cell plate
B. cleavage furrow.
C. Clones.

Cytoplasm division resulting in 2 genetically differ daughter cell T / F.

The End. ♡

Important terms –

Meiosis انقسام منصف

Parent cell خلايا الأصل (الأب، الأم)

doughther cell خلايا البنوية

sexual جنسي
asexual لا جنسي

reproduction تكاثر
fertilization اخصاب

autosomes تشير إلى الكروموسومات الجسدية
sex chromosome كروموسومات جنسية

ovaries مبيض
testes خصية
egg بويضة
sperm حيوان منوي
zygote (ملقحة) خلية مخصبة

aligned اصطفاف

crossing over عبور جيني

synapsis تشابك

variation تنوع

Ch13 : sexual life cycle & Méiosis

⇒ Méiosis = Meitotic division.
it is the division that reduce number of cell chromosome of half.

* Each gene in an organism's DNA exists at a specific locus on a certain chromosome.

divid to:
- ⇒ asexual reproduction: a single Parent produces genetically identical offspring by Mitosis
- ⇒ sexual reproduction: combines genes from two Parent, leading to genetically diverse offspring.

- Fertilization & miosis alternate in sexual <u>life cycle</u>

smile for life ^_^ smiling at you ..

is the generation-to-generation sequence of stage in the reproductive history of an organism.

- Normal human somatic cell are diploid. The have 46 chromosome made up of two sets of 23.
- Human diploid cell have 22 homologous pairs of autosomes & one pair of sex chromosome: the person is female (XX) .. or mal (Xy) ..

- ovaries & testes produce haploid gametes by Méiosis,
تقدر تفهم سوا ← يعني آل(جاميت) عندي ده 23 كروموسوم

- During fertilization, an egg & sparm unite, forming a diploid ($2n = 46$) single called zygote. which developed to multicellular <u>organism</u> <u>by</u> mitosis.

... شغلك أجمد

parent cell 46 (2n) $\xrightarrow{\text{Meiosis}}$ daughter cell (n) haploid

↓

each contain 23 chromosome

Note Haploid (n) ⇝ cell that contain 1/2 number of parent cell chromosome.

The stage of Meiosis ...

- Interphase → G1, G2, S
  - organelles duplicate (centromer duplicate)
  - DNA duplicates (In-Sphase)
- Meiosis — Meiosis I
  - prophase I
  - metaphase I
  - Anaphase I
  - Telophase I
- Meiosis II
  - prophase II
  - metaphase II
  - Anaphase II
  - Telophase II
- → cytokinesis II

ادرس مبيح الموبايل ملحق عليه

Meiosis I

seperates homologous chromosomes.

1. ptophase I ⇒ synapsis = each 2 chromosome close (pairing) to each other as pairs gene to gene.

each pair called homologoun chromosome tedra

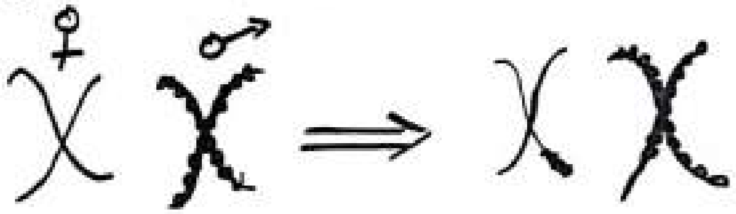
- centrosomes movement, spindle formation & Nuclear envelope breakdown occur as in mitosis.
- chromosome condense.

- each chromosome pairs with it's homolog aligned gene by gene.
- & occure crossing over.

So, synaptonemal complex (cohesin) يتماسك, protein that hold homologus chromosome together during synapsis

→ Crossing over:

exchange of genes (chromosomes pieces) between non-sister chromatids of homologus chromosome resulting in chromosome from 2 sister chromatids genetically not identical (different) resulting in genetic variation.



- each homologous pair has one or more X-shape regions called (chiasmata). where crossovers have occure.

2. Metaphase I : chromosome line up [align] as pairs in the meta-phase plate.

اذكر نقطة ١٠ بشو بتحكيلك
ولا تخربط اول
^^

3. Anaphase I
- chromosome separation
- each chromosome in duplicated composed from 2 sister chromatids genetically not identical
- chromosome move at poles تبتعد بعيدا للأقطاب

- each half of the cell has complete haploid set of duplicated chromosome.
- each chromosome is composed of two sister chromatids : one or both chromatids include regiones of non sister chromatid DNA.

cytokinesis I

- usually occure simultaneously with telophase I
- forming two haploid daughter cell.
- In Animal cell like these a cleavage furrow form, In plant cells a cell plate forms.

- Meiosis II : seperates sister chromatids.
- Prophas II : 1. Aspindle apparatus forms.
  2. Centrosome at poles.
- Metaphase II : 1. chromosome are positioned at the metaphase plate
  2. the two sister-chromatids are not genetically identical ..... why ?? ← السؤال ذاك لوسمحت
  3. Kinetochores of sister .... بيجلج منك ما يعزك chromated are attached to Microtubles extending from oppiste poles.
- Anaphase II 1. sister chromatid separte.
  2. The chromatid move toward opposite poles
- Telophase II 1. Nuclei form
  2. the chromosome begin decondensing

4 daugther cell; each with a haploid set of (unduplicated) chromosome.

(Note)

Meiosis II are simillar to mitosis, but Meiosis II occur in reproductive cells to give 4 dougther cell (1n).

- In general: Human somatic cell

46 chromosome (23 pair)

- autosomes
  - 44 chromosome
  - 22 pair
- sex chromosome
  - 2 chromosome
  - 1 pair
    - ♂ (xy) male
    - ♀ (xx) female

♂ gamete (sperm) + ♀ gamete (egg) → fertilization → zygot → mitosis → embryo → meiosis → gametes

(Note) Meiosis I is called the reductional division becouse it is reduces the number of chromosome sets from two (diploid) to one (haploid)

Meiosis II is called the equational division; sister chromatids separate, prducing haploid daugther cell

خلصنا قمة دورك عيد شكرين وانهم صح ... "موفق"

1. In Human the ovum over (egg cell) has 23 chromosomes; 22 autosomes & one (X, Y) chromosome ? T, F

2. Meiosis produces :
   1. two cell, each diploid.
   2. Four cell, each haploid.
   3. Four cells, each diploid.

3. sister chromatids separate in
   • prophase I • Meiosis I • interphase • Meiosis II

4. In Human each somatic cell has 44 chromosome ? T, F

5. ..... produces gametes & reduces of chromosome by half

6. which of the following occurs in meiosis but NOT in mitosis ?

1. chromosome replication 2. synapsis 3. crossin over 4. (2 & 3)

7. Mitosis is made from two divisions ? T, F

8. seperates homologous chromosome in Meiosis I ? T, F

9. each 2 chromosome close to each other as pairs gene to gene called .....

1. synapsis 3. chiasma.
2. splitting

10. Meiosis is a process by which

1. DNA is replicates
2. cell grow in size
3. cytokinesis occurs
4. a cell's nucleus divides.

14. chaismata are Y-shape region where crossing over occure? T, F

حطها قاعدة... لم تبلش شي لا تقشي بدون ما تكملو للآخر

خليكي رايقة وادرس بروااق....

CH(16): Nucleic Acids and Inheritance.

Inheritance: الوراثة
Rules: قواعد
Diffraction:
Modle: نموذج
Handed: مؤشر/جهة
Twisted: متشابك/ملفوف
Unwinding: فك التشابك
Uniform: ثابت/منتظم
Ladder: سلّم
Stabilize: استقر
Antiparallel: غير متماثل
Rapid: سريع
accurate: دقيقه
Semi_Conservative: شبه محافظ
Template: قالب
Despersive: محافظ
Bubble: فقاعه
Forks: شوكة
Vis versa: العكس بالعكس
Repair: اصلاح

شوي و بتخلص كل المادة...

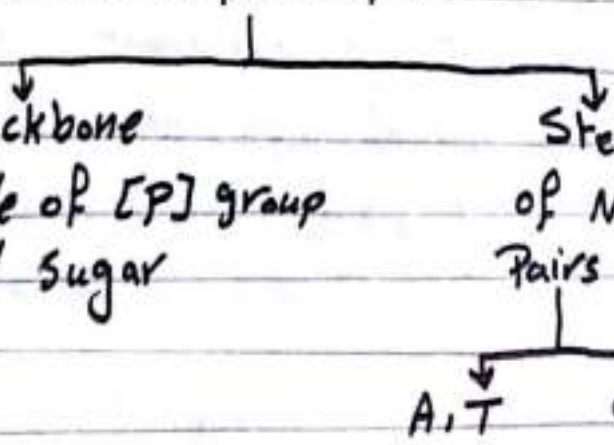
Inheritance ≡ heredity
↳ transfer of genes from Parents to offspring

⟶ DNA is genetic material
* DNA composed from 4 nitrogenous bases.

Erwin chargaff
⟶ The laboratory of Biochemist is discovered N.B in DNA (A, T, G, C).
* chargaff rule :-
① A Pair with T
② C Pair with G

Roseland Franklin
⟶ X-ray diffraction crystalograph image for DNA; that allowed watson and crick to put DNA model.

Watson and Crick DNA model
- DNA is a Polynucleotide
- DNA is a Double helix
- DNA is right-handed
- has uniform width
- the arrangment Similar a rope ladder with rigid rungs, so it's compound of :

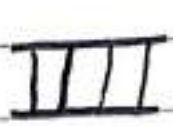


- A purine pair is too wide and a pyrimidine pair too narrow
- Full turn : is 3.4 nm in length ، contain 10 bp.
  * المسافة بين القاعدتين = 0.34 nm
- 2 bond stabilize DNA :-
  * Phosphodiester linkage
  * H - bond.
- 2 strand of DNA are Anti-Parallel run opposite to each other.
- 2 strand of DNA are Complementry ; according to Chargaff rule.

⟶ DNA Replication

- Rapid & accurate
- Complex
- Endergonic
- Semi-Conservative

* Semi - Conservative DNA replication :-
  - 2 strand of parental DNA Seperate (old)
  - each old DNA strand will be used as template for synthesis of new complementry antiparallel strand.
  - at the end of replication each daugther DNA is composed from 2 strand → old / New



3 model for DNA replication
1. Conservative model.
2. Despersive model.
3. Semi_Conservative model.

Steps DNA replication

1. untwisted / unwinding by Helicases Enzyme
2. breakdown of H-bond & seperation of the 2 strands starting from origin of replication ; resulting in formation of replication bubble (is composed from replication forks)
   - one bubble in Prok. DNA
   - Several bubble in Euk. DNA.

- Topoisomerase ≡ breaks, swivels, and rejoins the Parental DNA ahead of the replication fork, relieving the strain cased by unwinding.
- Single-strand binding Protein Stabilize the unwound Parental strands.

Note A replication Forks ⟶ Y-Shape region.

3. primase : adds primer ⟶ Short RNA piece. at the origin.

- primase Starts a complementry RNA chain from a single RNA nucleotide, adding more RNA nucleotides one at time, using the Parently DNA strand as a template.

- The completed primer, generally 5-10 nucleotides
- The new DNA strand will start from the 3` end of the RNA Primer.

4. DNA Polymerase III
- Start DNA synthesis by adding nucleotides to an RNA primer
- Starting from 3` end of the primer by linking the 5` end of new DNA to the 3` end of the primer Never vis Versa From (5`-3`).
- each fork 2 new DNA strands are synthesized :.
  1. Leading strand ⟶ continuous with one primer
  2. Lagging strand ⟶ discontinous made of short DNA pieces called Okazaki Fragments

5. DNA Polymerase I :- removes primers replacing them with short DNA pieces (5`-3`).

6. DNA ligase :- connect DNA Pieces together.

⟶ 3 repair mechanisms that ensure that DNA replication is accurate :-

[1] Proof-reading mechanism

[2] Mismatch repair

[3] Excision repair.

Protein	Function
Helicase	unwinds Parental double helix at replication Forks.
Single - Strand binding Protein	Binds to and stabilized single Stranded DNA until it is used as template.
Topoisomerase	Relives overwinding Strain ahead of replication forks by breaking, Swiveling, and rejoining DNA Strands.
Primase	Synthesizes an RNA Primer at 5' end of Leading strand and at 5' end of each okazaki Fragment of Lagging.
DNA Pol III	Using Parental DNA as a template Synthesizes new DNA Strand by adding nucleotide to an RNA Primer.
DNA Pol I	Remove RNA nucleotide of Primer from 5' end and replaces them with DNA nucleotide.
DNA ligase	Join okazaki Fragment of Lagging Strand; on leading strand, joins 3' end of DNA that replaces Primer to rest of leading Strand DNA.

ملاحظة: ادرج الصور الموجودة في الكتاب يا شطور ^^

Problem :.

Q1 :- DNA polymerase III catalyzes the elongation of a DNA strand in the 3` – 5` direction ! T / F

Q2 : During DNA replication ; the protein _____ connect DNA pieces together

Q3 : DNA Polymerase I Starting from 3`end of the Primer ! T / F

Q4 : In the Watson and Crick model of DNA , the "steps" of the Ladder are composed of :

A - Sugars B - two Purine C - A Purine & Pyrimidine

D - a sugar and Phosphate groupe

Q5 : During DNA replication, the enzyme _____ . Catalyzes the elongation of new DNA by adding nucleotide to 3` end of the previous nucleotide

Q6 : The X – ray diffraction photography of Rosalind Franklin was an evidence in the Study of DNA

A - indicating that DNA has a double helix Structure

B - showing equal number of Purine and Pyrimidine

c - showing the basese of DNA were held together by hydrogen bonds

D – showing the structure of the deoxyribose Sugar

Q7 : the first steps in DNA replication is winding the double helix by Helicase enzyme! T / F .

CH(17): The Expresion of Genes.

→ Gene : trait (الصفة)

Gene (DNA) $\xrightarrow{\text{Transcription}}$ RNA $\xrightarrow{\text{Translate}}$ Protein

* Transcription
  - is the DNA directed synthesis of RNA
  - Euk → in nucleus
  - Prok → in cytosol
  - RNA synthesis is catalyzed by RNA Polymerase
    - ↳ which links together RNA nucleotides complementry to DNA templet Strand. A U X C G
    - ↳ This process ; the same base-pairing rules as DNA replication ; except that in RNA , Uracil substitutes for thymine.
  - The 3 stage in transcription :
    1. Initiation
    2. Elongation
    3. Termination.

* Translation

- is the RNA directed synthesis of a Polypeptide
- A cell translates an mRNA message into protein using transfer RNA (tRNA).
- The 3 stage of translation:
  1. Initiation
  2. Elongation
  3- Termination
- occure in : Prok & Euk ⟶ cytosol + needed ribosome

⟶ Genetic Codes

↳ sequances of N.B on mRNA strand

* codons ≡ 3 N.B
* Genetic information ⟶ is encoded as sequance of nonoverlapping nucleotide triplet or codone
* A codon in mRNA either is translated into an amino acid (61 of the 64 codons)
  or several as stop signal (3 codon).
* Codone must be read in the correct reading frame.

- Reading the Genetic code :

5' _ 3' , 5' to 3'

* Properites of Genetic code :-

- triplets (codon) ⟶ specify on a.a.
- Almost universal
- Codon in Genetic code is the alphabet of Genetic code (64 Codon > 20 a.a).

* 1 Start Codon:

AUG specify [Methionin]

* 3 Stop codon:

Specify No. a.a (UAA, UAG, UGA).

* Several Codon specify one a.a :-

UUU : Phenaylalanin (اسم عجيب امينتي)

AAA : Lys

GGG : Gly

CCC : Pro

حيث اسماء احماض امينية

Note :- The First codone deciphered (UUU)

اول كودون تم اكتشافة .

Problem:-

Q1: Reading the genetic code from 3' to 5'? T/F

Q2: Sequance of N.B on mRNA strand are Anti-Parallel and Complementry? T/F

Q3: Each one codon specify one amino acid? T/F

Q4: The genetic code on mRNA is called Codon? T/F

Q5: If a DNA Sample contain 10%. adenine, what is the Cytosine Percentage in this sample?

A- 10%. B- 40%. C- 20%. D- 80%.

Q6: In the genetic code there are three Start signals and one stop signal? T/F

Q7: In the double helix Structure of nucleic acid, Cytosine hydrogen bond to guanine? T/F

Q8: which is NOT true about the genetic code:-

A. most a.a have only one codon

B- it is composed of triplet code of three bases per codon

C- it Produces 64 different Possibilites of base sequences

D- it contain start and stop codons as instruction.

END ... ^^