CLASSIFICATION

~~T~~ Type of cell

Prokaryote
~~std~~.
→ primitive
~~X~~ nucleus

naked nucleus
- devoid of nuclear membrane
- nucleoid

→ no organelles

Eukaryotic
~~not~~
true nucleus
↳ with a nuclear membrane.

Karyon
↓
nucleus.

→ ~~sp~~ specific organelle present for specific functions.

Unicellular organism requires
→ energy → phototropic (light), chemotropic (chemical)
- electron → reqd for metabolism
- carbon

inorganic substances as electron source
→ lithotrophs

organic substances
→ organotrophs

those organism that can utilise CO_2 as sole carbon source. they are called autotrophs

those organisms that use anything other than CO_2 are called heterotrophs

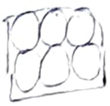
- Chemolitho autotrophs
- Photo organo troph.

organization

all functions performed by one cell →  unicellular ← cellular level

there is division of labour
cellular level → 

diff type of cells
multicellular



tissue,
~~tests~~ cells that look same, can operate and perform similar functions

Organization

Cell
↓
Tissue
↓
Tissue system
↓
ORGAN
↓
Organ system
↓
organism.

Digestion & Digestive system

Intracellular

Extracellular → humans

fungus release digestive enzyme outside its body. (extra cellularly).

vacuole
(rich in hydrolytic enzyme (acid hydrolase) digestive enzymes.

endocytosis

Body plan → Tube within a tube.

Cellular ~~organisatio~~ aggregate

Blind sac

Circulatory System

Open

Closed

heart → artery

veins.

F^+ pili produced

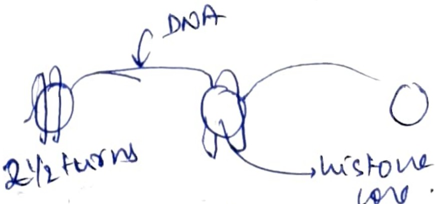
F^- pili not produ

TRANSDUCTION TRANSFORMATION CONJUGATION

always block .

1.1 – 1.2 m dna .

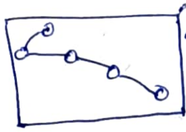
DNA
↳ -vely charged



Basic aa → histone proteins . ⇒ +vely charged.

$\underbrace{H_2A, H_2B, H_3, H_4}_{\text{2 of each}}$ → 8 protein → octameric core of histone

Histone (+ve) + DNA (-ve) → Nucleosome



⇒ bead on string structure .

1st level of packaging

O

A

A	B
0	0
0	1
1	0
1	1

S

S	C
0	0
1	0
1	0
0	1

```
always @A begin
case (A)
2'b00 : O <= 2'b00 ;
2'b01 : O <= 2'b10 ;
2'b10 : O <= 2'b10 ;
default : $display("Error");
endcase
end
```

chromosomes
genes .

Replication → DNA dependent DNA synthesis
Translation → RNA " protein synthesis
Transcription → DNA " RNA " .

→ Central Dogma

replication occurs for full DNA

Central Dogma

DNA → 2–10% : RNA → 10% converted to proteins.
DNA → protein.

gene → portion of DNA that gets converted to protein.

sister chromatids

- somatic cell div → mitosis
- germ cell div → meiosis.

46 → 23 ♀, 23 ♂

Mitosis	Meiosis
→ occurs in somatic cells	→ germline (sexual) cells
→ 46 → 46, 46	→ 46 → 23, 23

→ Crossing over takes place b/w homologous chromosomes.

Mendel → father of genetics.

Garden pea ⇒ ~~pis~~ Pisum sativum:
- completes life cycle in 1 season
- self + cross
- large no of progeny produced
- varieties of characteristics
- with contrasting pairs for each characteristic.

2 pairs of same characteristics.

alleles → dom. T, rec. t

1. Ht
2. Flower color
3. pod color
4. position of flower → W
5. seed colour
6. seed shape
7. pod shape.

Tall plants × Dwarf plants.
TT × tt

~~phenotype~~

Tt
- phenotype
- genotype

Tt × Tt → T, t, T, t

- selfing.

	T	t
T	TT	Tt
t	Tt	tt

pheno: 3:1
geno: 1:2:1

1st law

A recessive characteristic expresses itself only in presence of another recessive.

Dominant expresses itself in presence of either recessive/ dominant.

	1	2	3
1	0	10	2
2	5	0	5
3	6	13	9

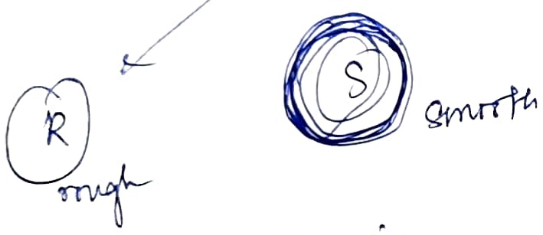
$g(2, \phi) = 5$
$g(3, \phi) = 6.$

$1 \to 2 \to 3 \to 1$

$g(2, \{3\}) = C_{23} + g(3, \phi) = 5 + 6 = 11$
$g(3, \{2\}) = C_{32} + g(2, \phi) = 13 + 5 = 18$

~~g(2,{3})~~
$g(1, \{2,3\}) = C_{12} + g$

Griffith's expt → DNA → Streptococcus sp. → ~~x~~ Mice



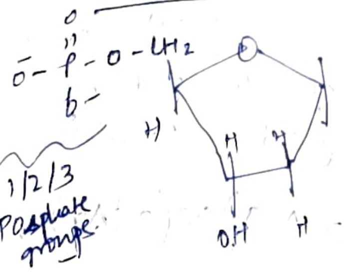
R-strain
⇓
avirulent

S-strain
- better adherence & colonisation
- acts as a protective layer.
- cause ~~more~~ to the disease better.
⇓
virulent bacteria

	R	S	heat killed S	heat killed S + R
mice				except / death
disease	×	✓	×	× / ✓

S - strain → heat labile ⇒ coat
→ stable → + (R) $\xrightarrow{\text{naked capsule}}$ R transforms to S.
⇓
transforming principle

DNA



1/2/3 Posphate groups

2'C devoid of oxygen.
uracil in RNA.
thymine in DNA.

$\underbrace{\text{ribose sugar} + N_2 \text{ base}}_{\text{Nucleoside}} + PO_4^{2-} \Rightarrow$ Nucleotide

$\left.\begin{array}{l} A = T \\ G \equiv C \end{array}\right\}$ complementary base pair

$\left.\begin{array}{l} \text{amt of adenine = amt of thymine} \\ \text{amt of guanine = " " cytosine} \end{array}\right\}$ Chargaff's law

DNA 5' - A G C T A A T T C G C 3' → template / non coding strand.
3' - T C G A T T A A G C G 5' → non template sense / coding strand.

anti parallel

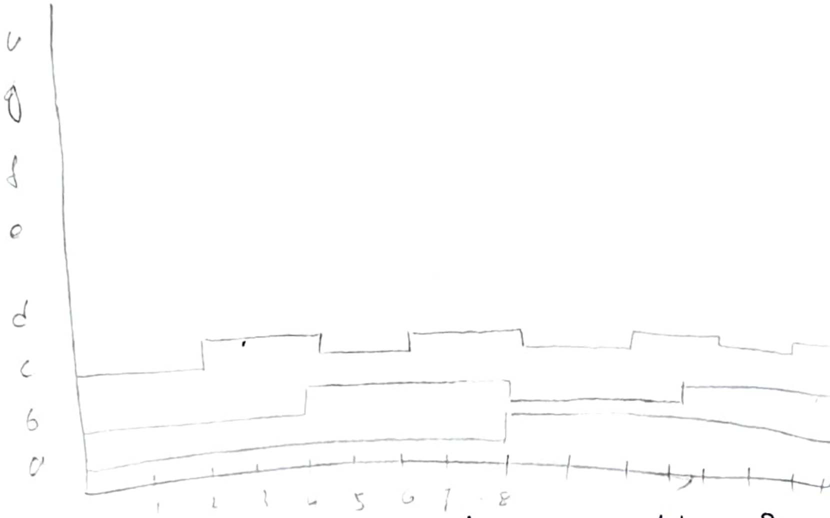
RNA 3' U C G A U U A A G C G 5'

Codon
- triplet

4:1

S_1	S_0	Y
0	0	I_0
0	1	I_1
1	0	I_2
1	1	I_3

$Y = S_1'S_0'I_0 + S_1'S_0I_1 + S_1S_0'I_2 + S_1S_0I_3.$



5' → 3 PO_4^{2-}'s
3' → OH ⇐ new nucleotides added here

why? ⇑ occurs in 5'–3'

8:1

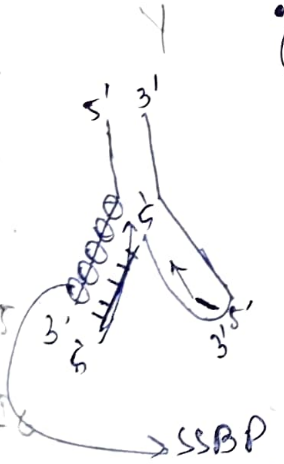
S_2	S_1	S_0	Y
0	0	0	I_0
0	0	1	I_1
0	1	0	I_2
0	1	1	I_3
1	0	0	I_4
1	0	1	I_5
1	1	0	I_6
1	1	1	I_7

Characteristic of replication

- semi-conservative
- bi-directional (replication fork)
- semi-discontinuous

(1) Initiation

1) helicase ⇒ separates
~~2)~~ exonuclease & endonuclease present → prevent
2) SSBPs
3) Topoisomerase/gyrase helps with supercoiling
~~4) DNA polymerase.~~
↓
4) RNA polymerase ⇓ makes a stretch of RNA ⇒ primer.
primase ⇓ works on both strands



6) DNA poly 5'–3'
7) ligase
(8) catamer/concatamer ⇒ Termination.

Okazaki fragments
short pieces of RNA primer + DNA

5) DNA poly I ⇒ removes RNA
5'-3' exonu activity

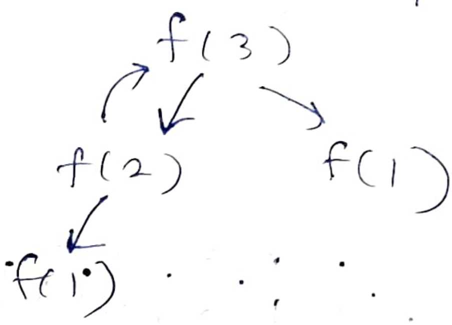
0	1	2	3	4
0,	1,	1,	2,	3

0	1	2	3	
0	1	~~-1~~ 1	~~-1~~ 2	-1

fibo (3)

$dp[3] = \overset{1}{\cancel{fibo}}(2) + \overset{1}{fibo}(1)$

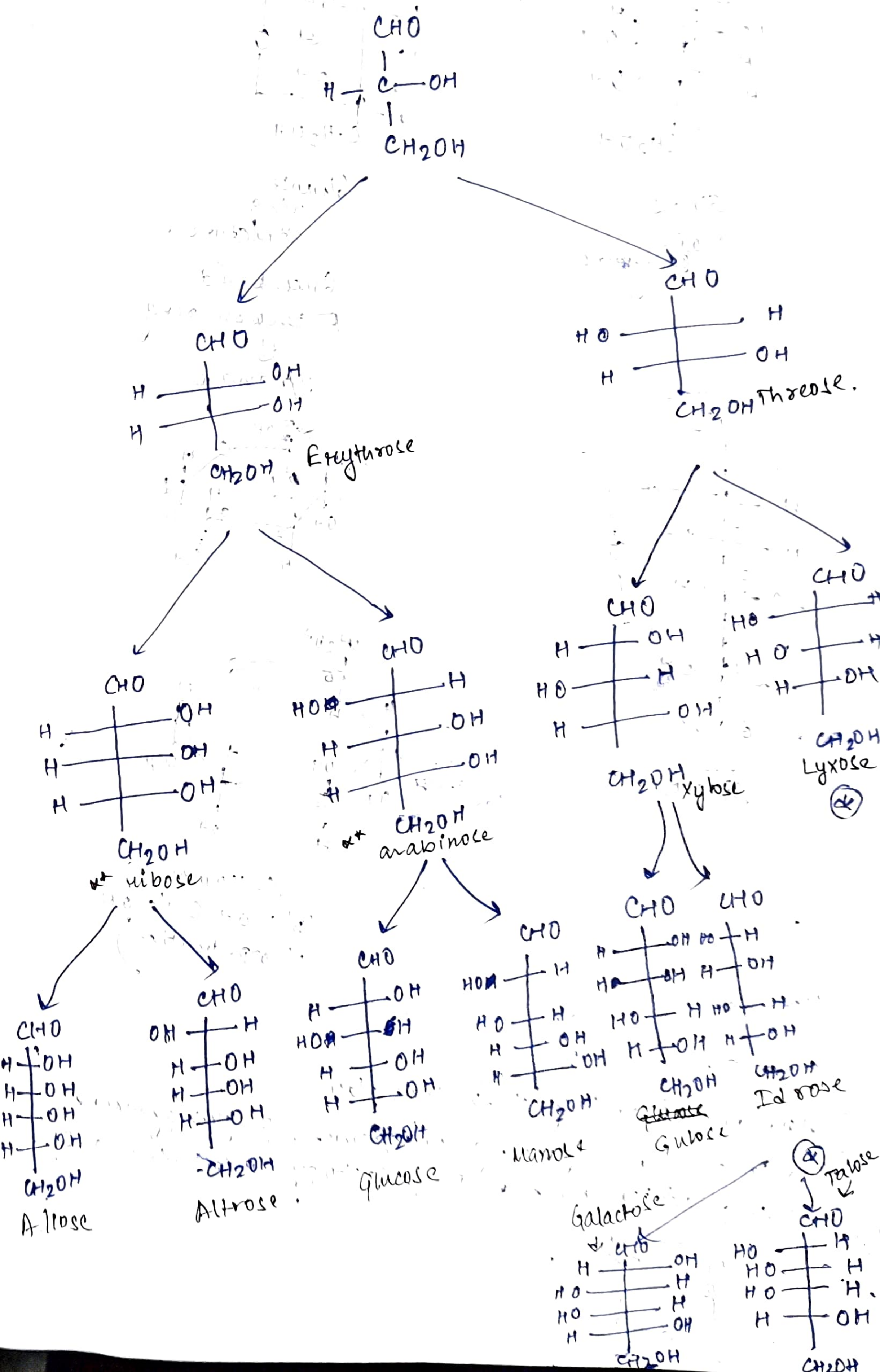
$dp[2] = \underset{1}{\cancel{fibo}}(1) + \underset{0}{\cancel{fibo}}(0)$



$^{n}C_{r} = {}^{n-1}C_{r} + {}^{n-1}C_{r-1}$

$f(n, r) = f(n-1, r) + f(n-1, r-1)$

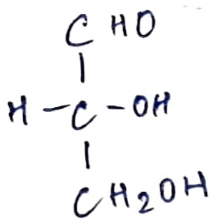
Starting from the mother carbohydrate show how 8 diff type of hexoses can be formed by Kiliani synthesis.

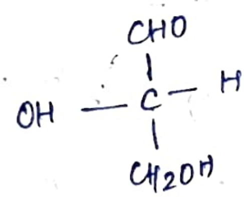


mother aldehyde
glyceraldehyde

Carbohydrates → aldose : CHO, [illegible]
$C_x(H_2O)_y$ → ketose : C=O bond
$R-\overset{O}{\overset{\|}{C}}-R'$

- Monosaccharides
  single sugar
- Disaccharides
- Oligo
  tetra
- Poly
  20-30.

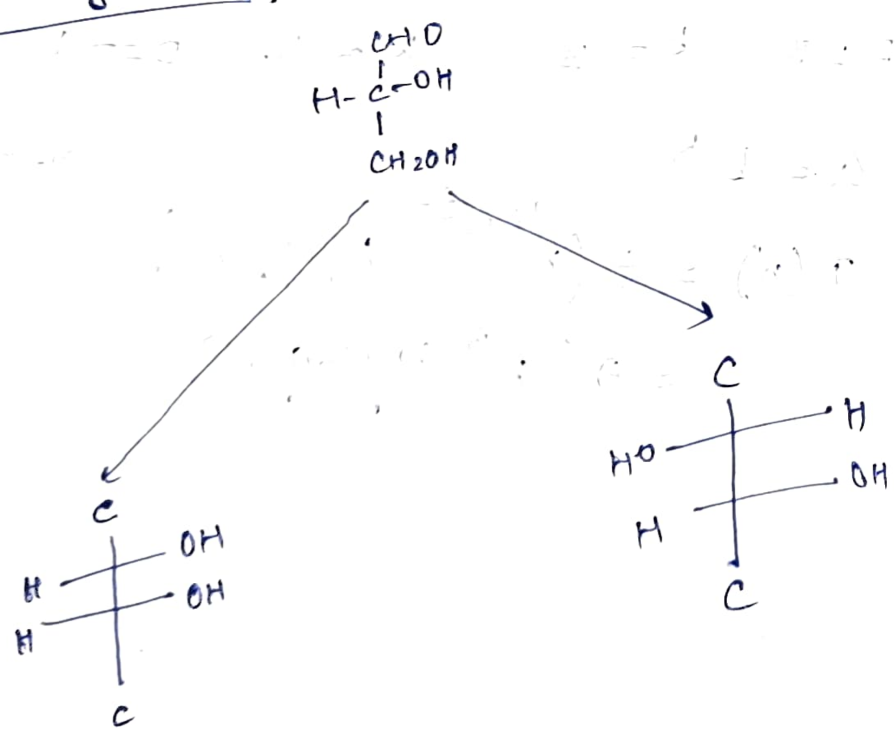

⇒ D-glyceraldehyde.


L-glyceraldehyde.

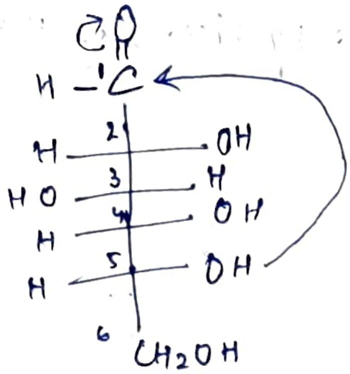
triose sugar.

biologically in our body we have D-isomers mostly

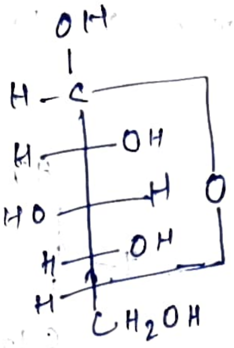
Kiliani Synthesis



Tetrose



Glucose chain Structure.



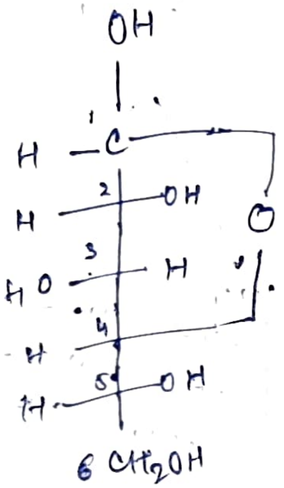
left → top

Glucose ring structure.

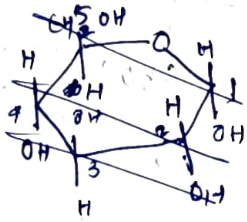
6 membered 5 carbon ring

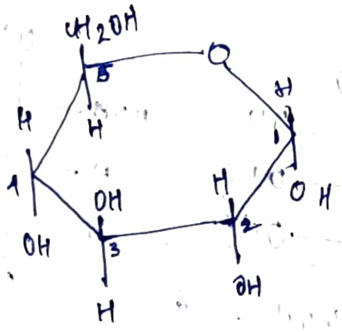
⇓

pyranose



furanose

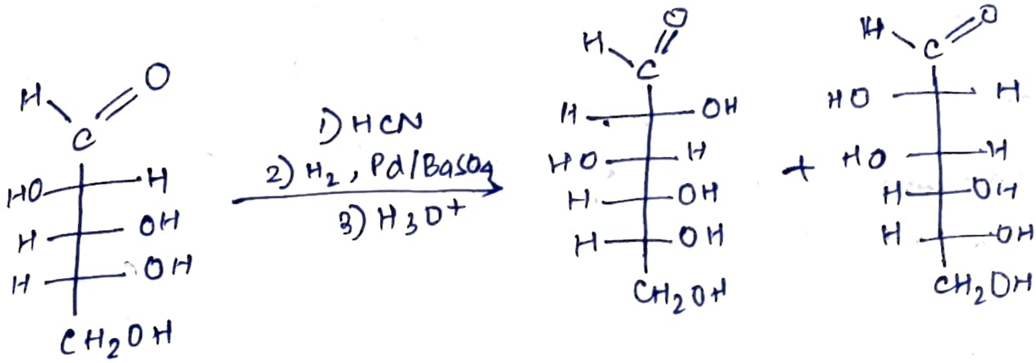




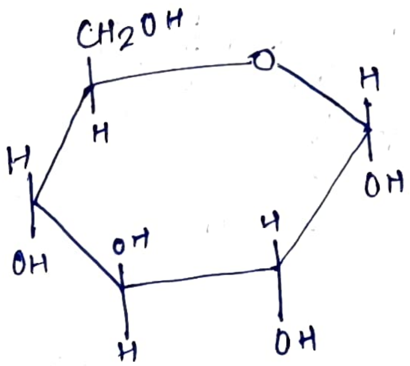
α-isomer (5'C OH & 1'C OH in opp. direction)

1) How does Kiliani synthesis takes place
2) Draw the str. of α-gluco-pyranose, β-glucopyranose, α-galacto pyranose, β-galacto pyranose, α-mannose, β-altrose.

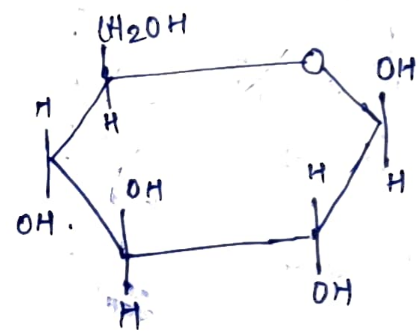
1)



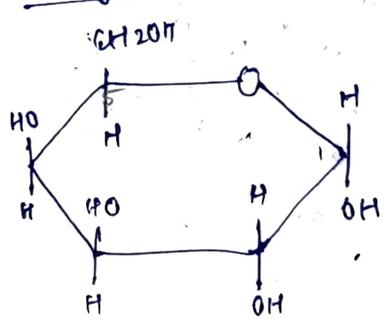
2) α-glucopyranose.



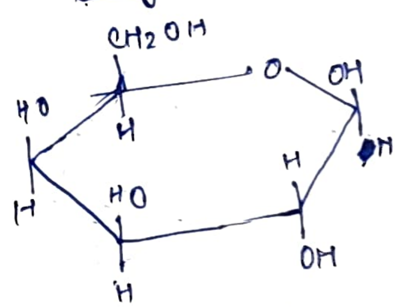
β-glucopyranose.



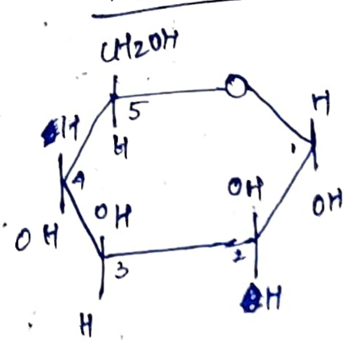
α-galactopyranose



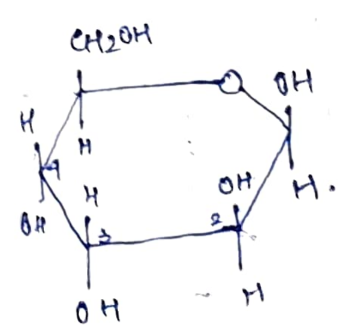
β-galactopyranose.



α-manose:



β-altrose:



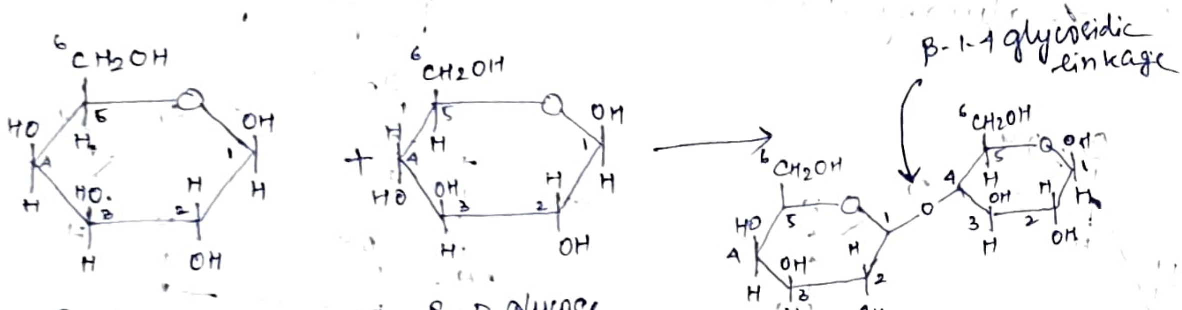
Q1) Write the reaction of Kiliani synthesis.

Q2) a) Draw the structures of (i) Lactose (ii) Maltose (iii) Sucrose

b) Mention the name of the bonds in each of the disaccharides.

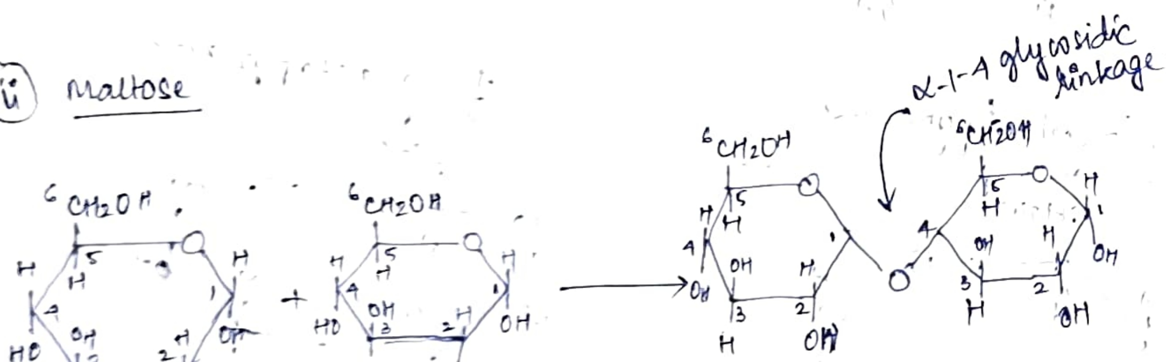
Ans.

2) (i) Lactose



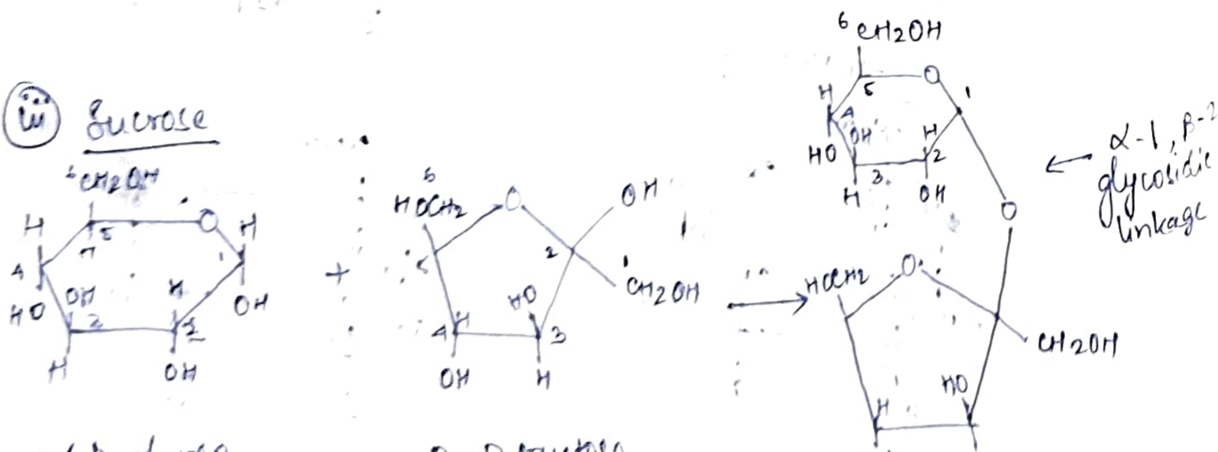
β-D galactose β-D glucose Lactose

(ii) Maltose



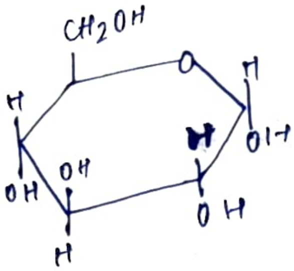
α-D glucose α-D glucose Maltose.

(iii) Sucrose

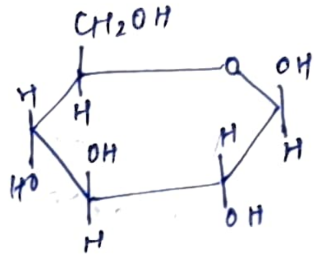


α-D glucose β-D fructose

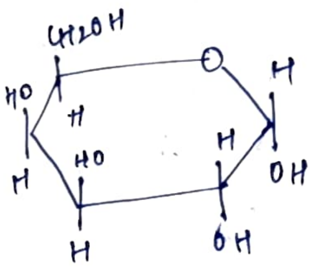
(3)



α- glucopyranose



β - glucopyranose



α- galactopyranose

Location : Cytoplasm

GLYCOLYSIS

→ preparatory
→ payback

→ takes place in aerobic and anaerobic org.

preparatory phase

Glucose

↓ ATP → ADP hexokinase/glucokinase

Glucose - 6 - phosphate

↓ hexose isomerase

Fructose - 6 - phosphate

↓ ATP → ADP phosphofructokinase → pacemaker

Fructose 1,6 bisphosphate

↓ aldolase

dihydroxyacetone phosphate (DHAP) $\rightleftharpoons$ Glyceraldehyde phosphate (GAP)

(triose phosphate isomerase)

payback phase

2 (GAP)

↓ dehydrogenase $NAD^+ \rightarrow NADH + H^+$

2 (3-PGAL)

↓

2 (1,3 BPGA)

↓ ADP → ATP kinase

2 (3 PGA)

↓ mutase

2 (2-PGA)

↓ enolase

PEP (phosphoenol pyruvate)

↓ ADP → ATP pyr. kinase

Pyruvate

keto - enol

~~ADP → ATP pyr. kinase → pyruvic acid~~

2 ATP used
4 ATP produced.

Q1) why is glycolysis known as glycolysis? How many stages can glycolysis be widely divided into? Name them and why are they so called? which step of glycolysis is known as the pacemaker of glycolysis & why?

Q2). Write the 10 ~~steps~~ reactions of glycosis mentioning the enzymes ~~and~~ involved.

Answers

① Glycolysis is called so as it breaks down glucose. i.e. lysis of glucose occurs.

Glycolysis can be widely divided into 2 stages:- ① preparatory phase ② payback phase.

- Preparatory phase is the investment phase. where 2 molecules of ATP are used and the hexose chain is cleaved into two triose phosphates.
- Payback phase is the second half of glycosis. It is the energy pay off phase where 4 ATP are produced. and 2(NADH+H+).

The conversion of fructose-6-phosphate to fructose 1,6-bisphosphate by enzyme phosphofructokinase using up 1 ATP molecule is known as the pacemaker step of glycolysis. as after this step the molecule is bound to go into glycolysis its fate is decided.

(2)

Steps of glycolysis :-

Glucose

↓ ATP → ADP [hexokinase/glucokinase] $\boxed{\text{Step 1}}$

Glucose-6-phosphate

↓ [hexoisomerase] $\boxed{\text{Step 2}}$

Fructose-6-phosphate

↓ ATP → ADP [phosphofructo kinase] $\boxed{\text{Step 3}}$

Fructose-1,6-bisphosphate

↓ aldolase $\boxed{\text{Step 4}}$

Glyceraldehyde-3-phosphate ⇌ dihydroxy acetone phosphate. (triose-phosphate Isomerase) $\boxed{\text{Step 5}}$

Prepara phas

↓

2(Glyceraldehyde-3-phosphate)

↓ [dehydrogenase] $NAD^+ \rightarrow NADH+H^+$ $\boxed{\text{Step 6}}$

2(3-phosphoglycerate)

↓

2 ~~1,3~~ (1,3 biphosphoglycerate)

↓ ADP → ATP [kinase] $\boxed{\text{Step 7}}$

2(3 phosphoglycerate)

Payback phase

$\downarrow$ mutase   Step 8

2 (2-phosphoglycerate)

$\downarrow$ enolase   Step 9

2 (Phosphoenol pyruvate)(PEP)

$\downarrow$ ADP → ATP   pyruvate kinase   Step 10

2 (Pyruvate)

- Net ATP produced = 2

The class of languages accepted by LBA & the class of CSL coincides.

	both aerobic and anaerobic	aerobic		anaerobic
	GLYCOLYSIS	INTERMEDIATE	KREBS	FERMENTATION
ATP	4 - 2 = 2	-	-	
GTP	-	-	2	
$NADH_2$	2 [6ATP]	2 [6ATP]	6 [18ATP]	used up (-)2 [6ATP
$FADH_2$	-	-	2 [4ATP]	

∴ For 1 molecule of glucose, no of ATP :-

<u>Aerobic</u>

$2 + 6 + 6 + 18 + 4 = 36$ ATP + 2GTP or 38ATP

<u>anaerobic</u>

$2 + 6 - 6 = 2$ ATP.

Photosynthesis

light

Glucose
↓
CO_2, H_2O

1. Reducing agent
2. ATP (energy)

Metabolism

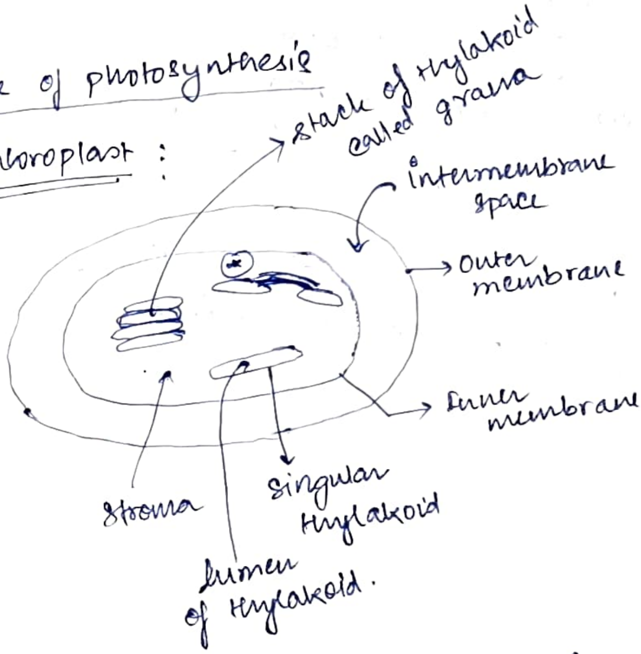
- Anabolism
  - requires ATP
- catabolism
  - destructive
  - ~~giv~~ releases ATP

Photosynthesis

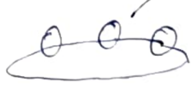
- light rxn
  - • light needed
  - • reducing agent and ATP formed.
- dark rxn: does not require light
  - CO_2
  - ↓
  - glucose

Site of photosynthesis

chloroplast :

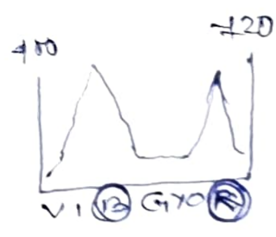


⊙ one thylakoid may be connected to another by stroma lamellae



photosystems on membrane of thyllakoid } here photosynthesis occurs

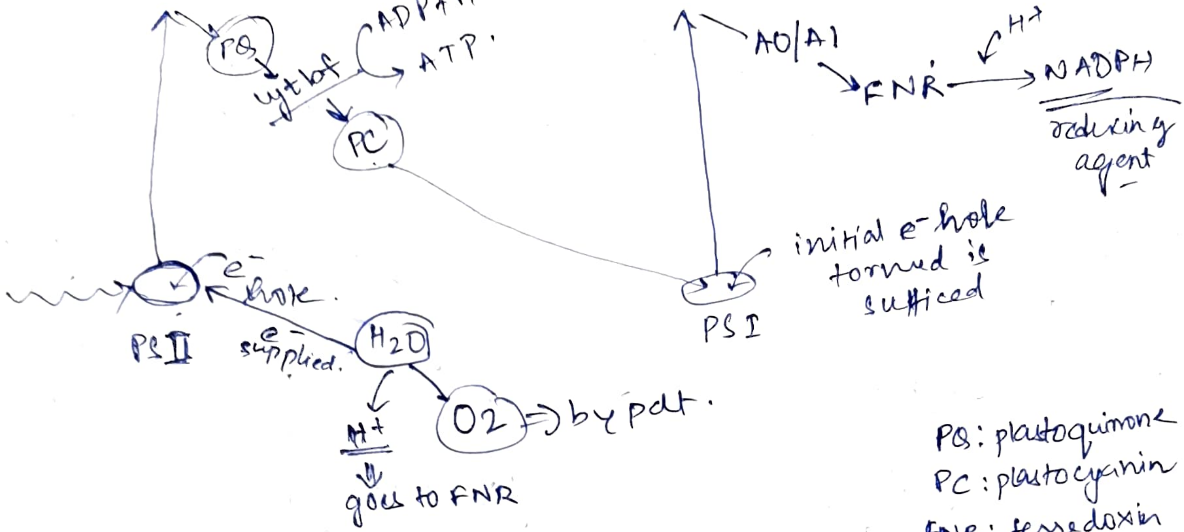
Photosystem :
- → P_{680} (PS II) : max^m absorption at 680 nm
- → P_{700} (PS I) : max^m . . . 700 nm



1. chlorophyll

ANTENNAE / Accessory pigments

Carotenoids
↓
$\boxed{Chl}$ ← Phycobilins
↑
Xanthophyll



PQ : plastoquinone
PC : plastocyanin
FNR : ferredoxin reductase

⇒ inside thylakoid : acidic
outside " : basic

↓ to remove these H^+

goes through FO-F1 complex ⇒ ATP produced.

- This scheme is known as Z-scheme of photosynthesis.
- This is also called non cyclic photo phosphorylation.

Since 8 doesnot appear in RHS in any prod^n L-E*
it's Contxt some sensitive

Microbiology.

Reproduction } Non defining.
Growth
Consciousness → receptiveness ⇒ coma patients.
→ response
defining { Metabolism
Organisation

Unicellular org.
⇓
growth & rep^n is synonymous

Growing bacteria

liquid.

turbidometric analysis
↳ not observed rightly in death phase.

turbidity increases gradually

solid
↓
colonies.

nutrients exhausted, toxic material accumulated

stationary phase.

D>>G
↳ death phase.