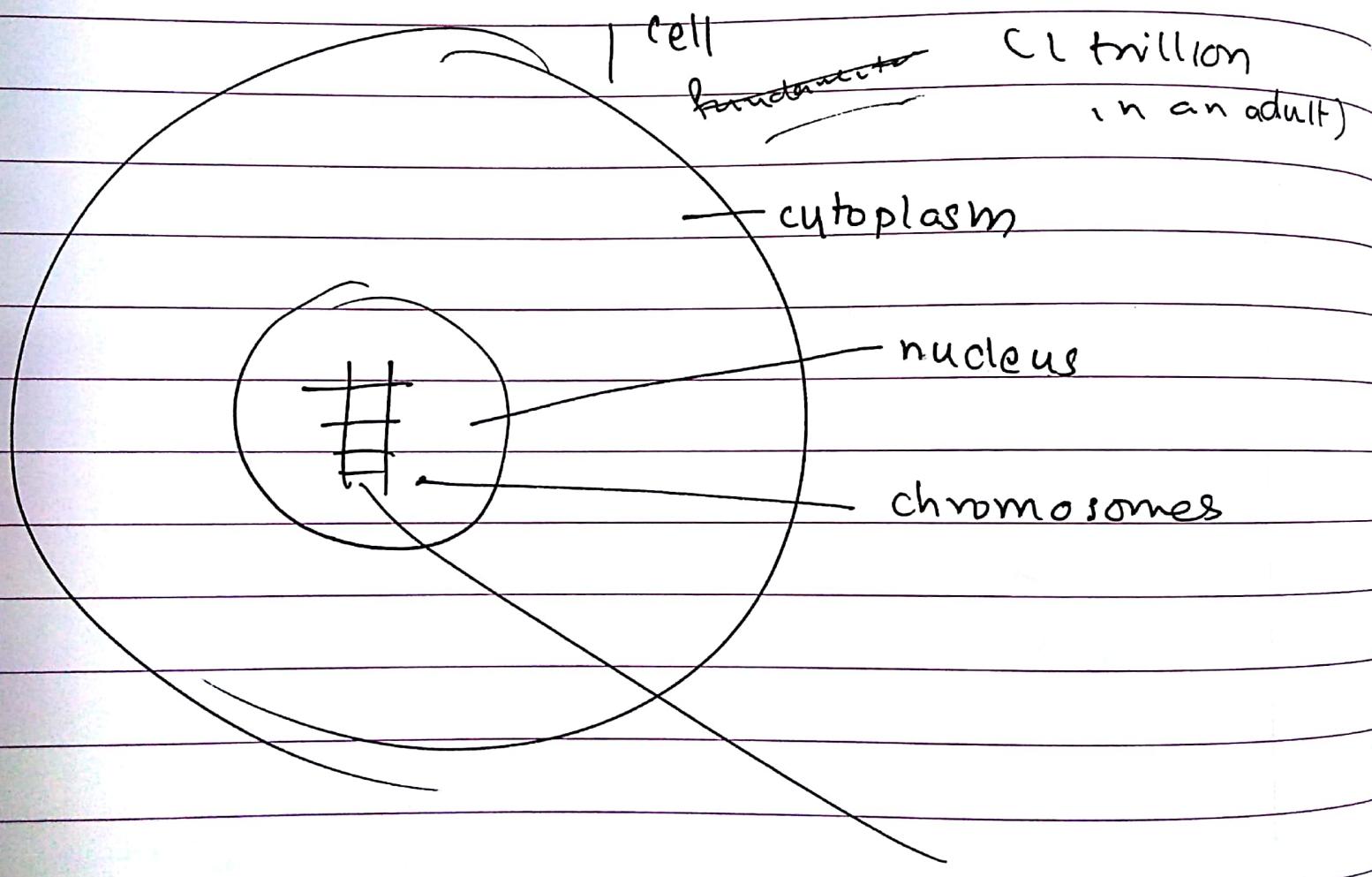
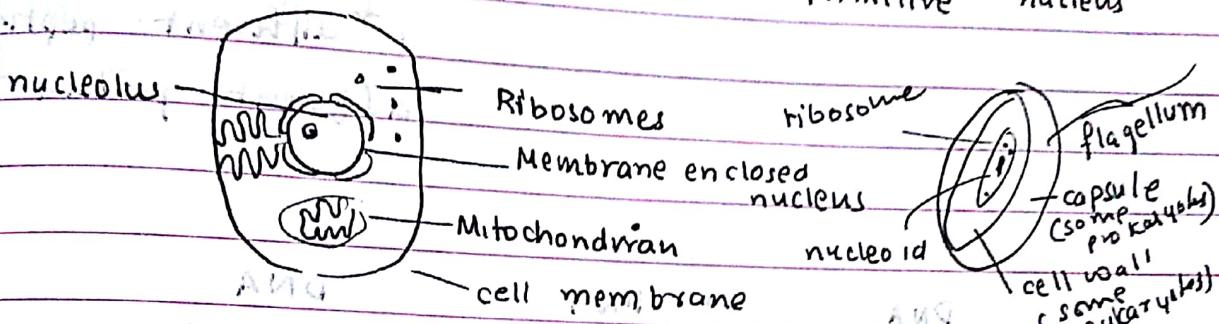


Where is a carrier molecule?



Eukaryote
true nucleus

Prokaryote
primitive nucleus



- o What is cell 2 fundamental unit of life → clustered → tissue
But single cell can also work like whole body

Prokaryote

genetic material NOT surrounded by cell membrane

Eukaryote

genetic material is surrounded by membrane

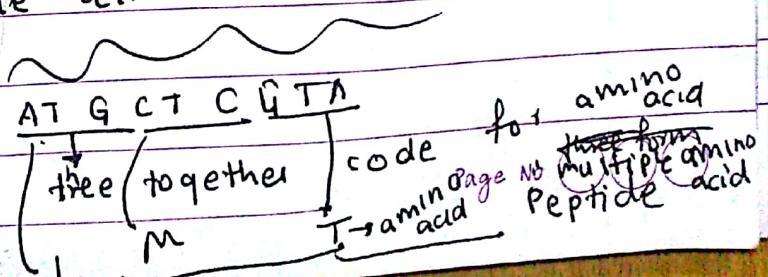
coded to give protein
transcribe → translate
DNA → RNA → protein

Deoxy Ribose nucleic acid

→ sequence of NUCLEOTIDES

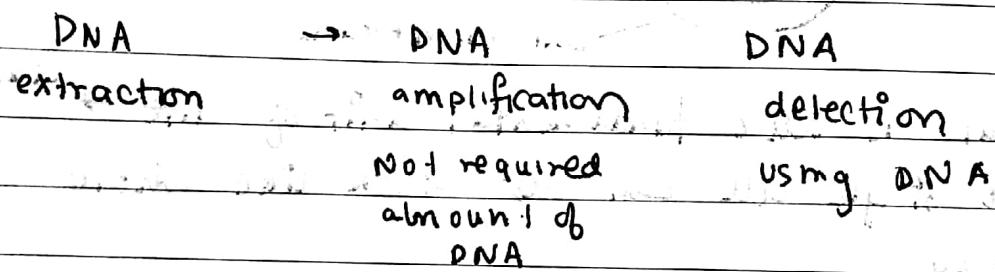
DNA inside the cell

+ coding for protein



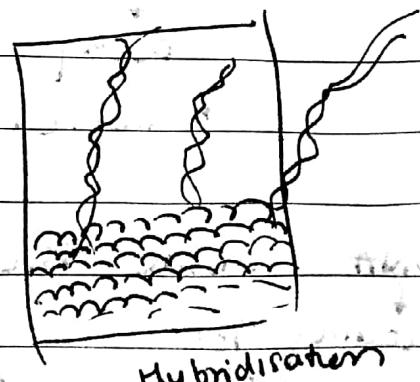
Alzheimer's → protein
breast cancer → tier 2 protein

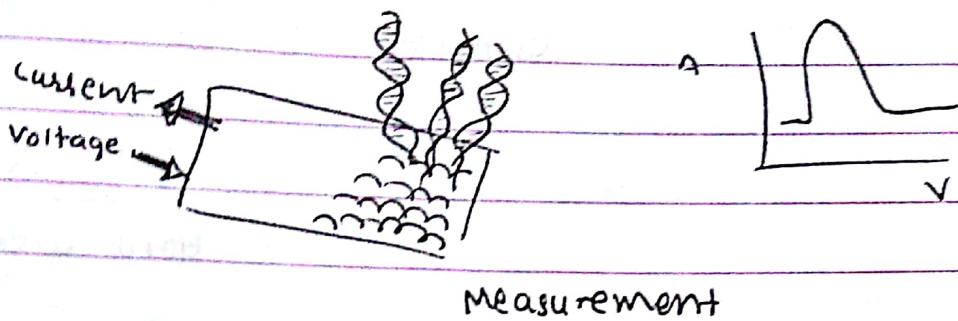
origin origin → faulty gene DNA sequence
faulty amino acid
→ different peptide
different protein →



SCREEN printed chips

sample
DNA strands
DNA probes (non conductor)
carbon electrode
molecule added to increase
conductivity
highly conducting
metallic surface
nanospheres
resistance
selection of nanomolecules





Glucose oxidase

Glucometer

↓ Prick
blood

contains glucose oxidase + glucose

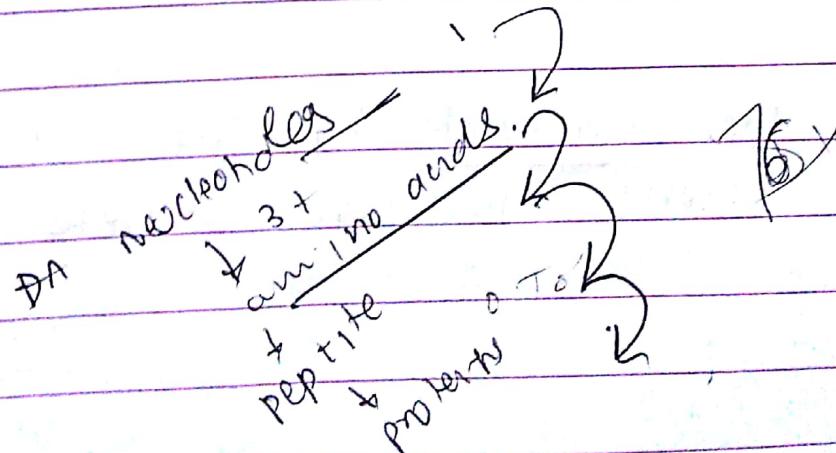
↓ redox reaction

↓ e⁻ involve (current)

Gene

Words for the day

- Genetic code
- glucose oxidase
- Her 2
- SCREEN printed chips



Genetics



Father of classical genetics

Gregor Mendel

Genetics:

study of the

They way plants and animals pass on their offspring such as eye colour, height, body build, hair colour, blood types, intelligence, gender etc.

heredity: characteristic that a child receives from both parents

What genetic

The blending hypothesis is the idea that genetic material from the two parents blend together

Eg blue + yellow = green

but the "type" depends on "concentration"

The particulate hypothesis is the idea that parent passes on discrete heritable gene units.

Mendel

Pisum sativum (Garden pea)

Advantages

- many distinct heritable features / characters, (e.g. flower color) characters variants (purple / white), & called traits
- Mating can be controlled.
- stamens and carpel present distinctly (sperm producing / egg producing)
- Cross pollination involved dusting pollen one plant on other (fertilization between different plants)

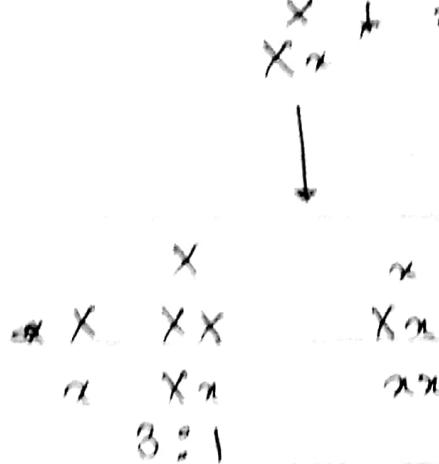
(P) = Parental generation (cross pollination)
purple white.

(F₁) First filial generation (All flowers purple)
offspring

(P) Generation purple x white
(true breeding parents)

(F₁) Generation All had purple
(hybrids self or cross pollination)

(F₂) generation 705 purple 224 white
flowered flowered



Notes

- The immediate generation does not show the characteristic as it remains dormant but the 1st generation does in ratio 3:1

First law of Mendel
law of Segregation.

When mendel

"character" defined by allele

Every character is controlled by dominant allele and recessive allele.
allele → alternative versions of a gene



Each gene resides at a specific location in the chromosome

P generation	Pp	X	pp
Appearance	Purple		white
Genetic makeup:	PP		pp
Gametes	P		P
F ₁			
Appearance: Purple			
Genetic makeup	Pp		
Gametes	$\frac{1}{2}$ P		$\frac{1}{2}$ p

F₂ Generation sperm from
 F₁ (Pp) plant

		P	P
egg from	P	PP	Pp
F ₁ (Pp) plant	P	Pp	pp

3 purple : 1 white.

Phenotype } outward expression of any individual / character
 Genotype } genetic profile of any individual or
 characters present within a character.

homozygous heterozygous.
 Eg PP PP Pp
 PP same phenotype, different genotype

Genotypic profile

1 : 2 : 1

PP Pp pp

Phenotypic profile

3 : 1

purple white

Eg

Dominant phenotype
unknown genotype

PP or Pq

X

recessive phenotype
known genotype

pp

P p
P Pp
P Pp

P p
P Pp
P Pp

$\frac{1}{2}$ purple

$\frac{1}{2}$ white

all purple

Y → yellow

~~y_n → green~~

\rightarrow round & npe

r → wrinkled.

p

YYRR ♂

YR

чурр

yr

f1

1

Yy Rr

hypothesis
of dependent
assortment

hypothesis of
Independent
assortment

$$\frac{1}{2} \quad \frac{1}{2}$$

YR yr

$\frac{1}{4} YR$	$\frac{1}{4} Yr$	$\frac{1}{4} yR$	$\frac{1}{4} yr$
$\frac{1}{4} YR$	$YRYR$	$YRYr$	
$\frac{1}{4} Yr$			
$\frac{1}{4} yR$			
$\frac{1}{4} yr$			

phenotypic expression

phenotypic expression.

9:3:3:1

Law of independence

hypothesis

Independent assortment

$\frac{1}{4}$ YR	$\frac{1}{4}$ Yr	$\frac{1}{4}$ yR	$\frac{1}{4}$ yr
$\frac{1}{4}$ YR	YYRR	YYRr	YyRR
$\frac{1}{4}$ Yr	YYRr	YYrr	YyRr
$\frac{1}{4}$ yR	yYRR		
$\frac{1}{4}$ yr	yYrR		

The words character and trait were used by
Mendel

Wilhelm Johannsen in 1905
 coined term gene.

DNA structure 1953

DNA isolated by Friedrich Miescher

Genetics (DNA fingerprinting)

Sir Alec Jeffrey Father of DNA

10 Sept 1984

fingerprinting

EU 8 American patent

Rajendra Singh father of DNA fingerprinting
 ... in India.

CD FD.

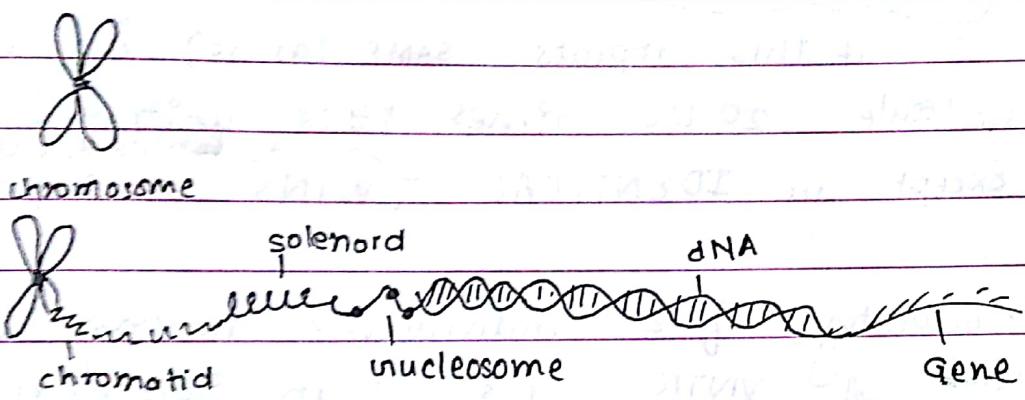
gene & DNA same chemical same fundamental unit being nucleotide composed of nucleotide sub technique based on

CLASSMATE
COMPOSITION

identification of nucleotide sequence
step III of DNA profiling
DNA fingerprinting aka (profiling or restriction analysis)

- DNA finger print → unique genetic make up.

Chromosome - chromatid - chromatin material - solenoid fibre - nucleosome - DNA - Gene.



nucleotide join together to form polynucleotide.

- Gene and PNA chemically same

DNA - fingerprinting → identifying polynucleotide sequence

Nucleotide sequence ↗ 99.9% of nucleotide sequence same

0.1% ↗ is different
VNTR

(variable number of tandem repeats)

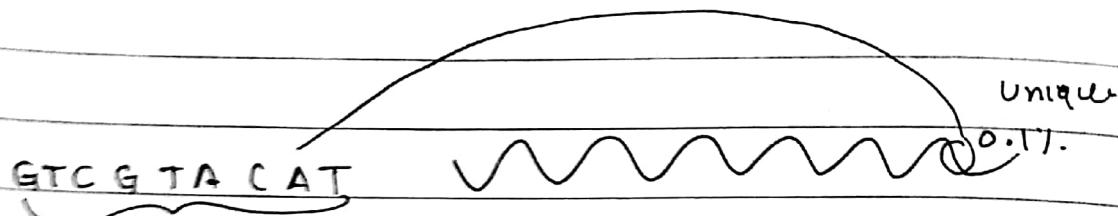
VNTR - Variable number
tandem repeat

our unique identity

classmate
COMPOSITION

VNTR → repeated several times [20-100 pp]

A Wyman & Rulifson (1980)



If this repeats SAME (as is) ⁶ in a nucleotide molecule 20-100 times, it is unique & called VNTR.
Except in IDENTICAL TWINS ^{to form individual} it is possible

Probability of 2 individuals having same
of VNTR is 1 in 300 million.

Discuss the steps & their importance in
DNA fingerprinting technology.

- | | |
|-------------------------|-----------|
| (1) G DNA isolation | ORDER IMP |
| (2) DNA amplification | |
| (3) DNA fragmentation | |
| (4) Gel electrophoresis | |
| (5) Southern blotting | |
| (6) Hybridisation | |
| (7) photo | |

No. of repeats = VNTR weights / sequence weight

Step I DNA isolation

CRIME SPOT



Search sample

From which DNA can be isolated

- hair (root hair)
- blood (WBC)
- tissue
- semen

any one of the sample is obtained -DNA is isolated

-DNA amount

will be v. less.

Step II: DNA Amplification.

DNA sample obtained is amplified

→ In In Vitro (Lab)

→ PCR technology

multiple copies generated in (polymerase chain reaction) short time.

Step III: DNA Fragmentation

DNA sample is subjected to RE (Restriction Endonuclease)

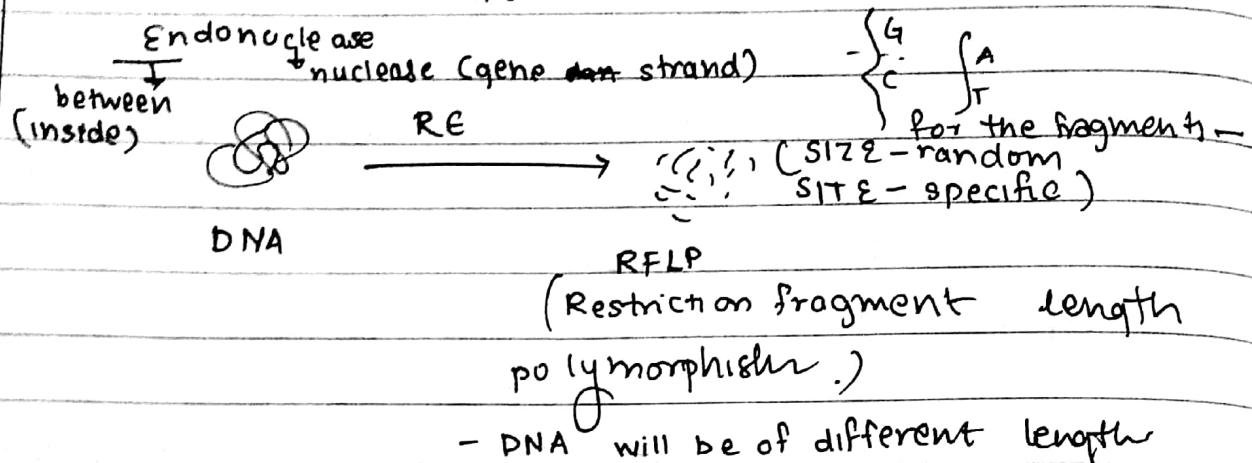
RE → aka (molecular scissor)

Double stranded DNA is fragmented

many fragments.

Page No. 000

RE - site scissoring is NOT random
Eg it will cut between
GC but not TA.



Step 4 : Gel electrophoresis (electro - current, phoresis - movement)

DNA fragments are separated based on their size using agarose gel

Charge of DNA : -ve charge CPO_4^{4-} (PO_4^{3-})

∴ DNA is added at -ve end.

Current flows from -ve to +ve.

shortest fragments move faster while longer (heavier) move slowly

Sample preparation → cell lysis → protein removal

Eg lipid, nucleus, protein
EVERYTHING
comes out

DNA purification

RNA

DNA

precipitation

Rehydration

Sample preparation → binding → Wash → DNA extraction

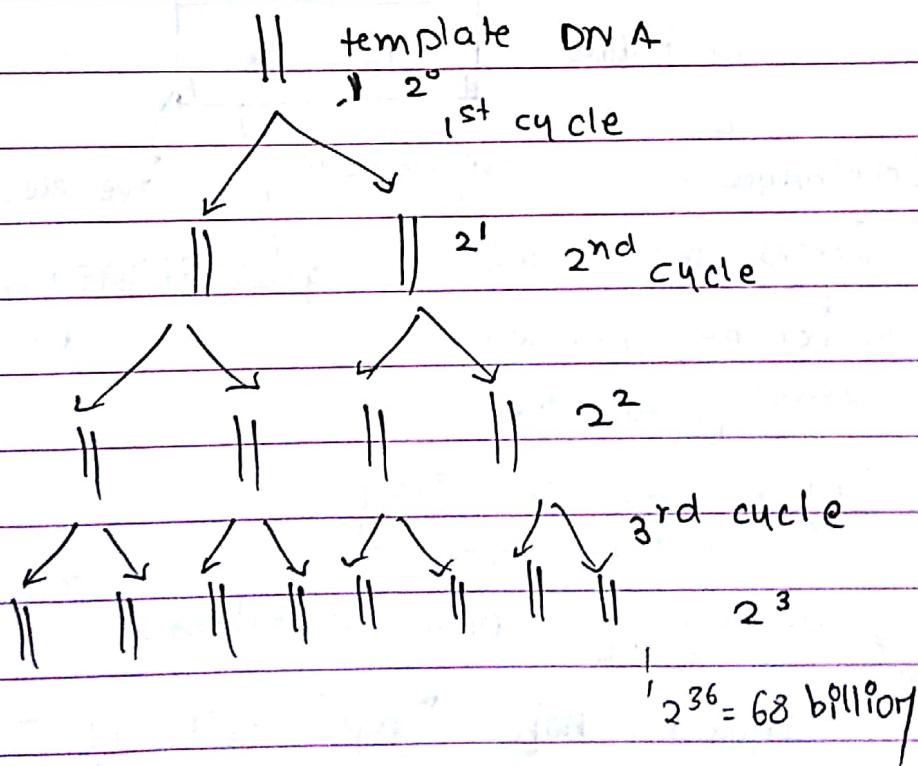
(P) Alkali lysis method

widely used

everything "comes out"

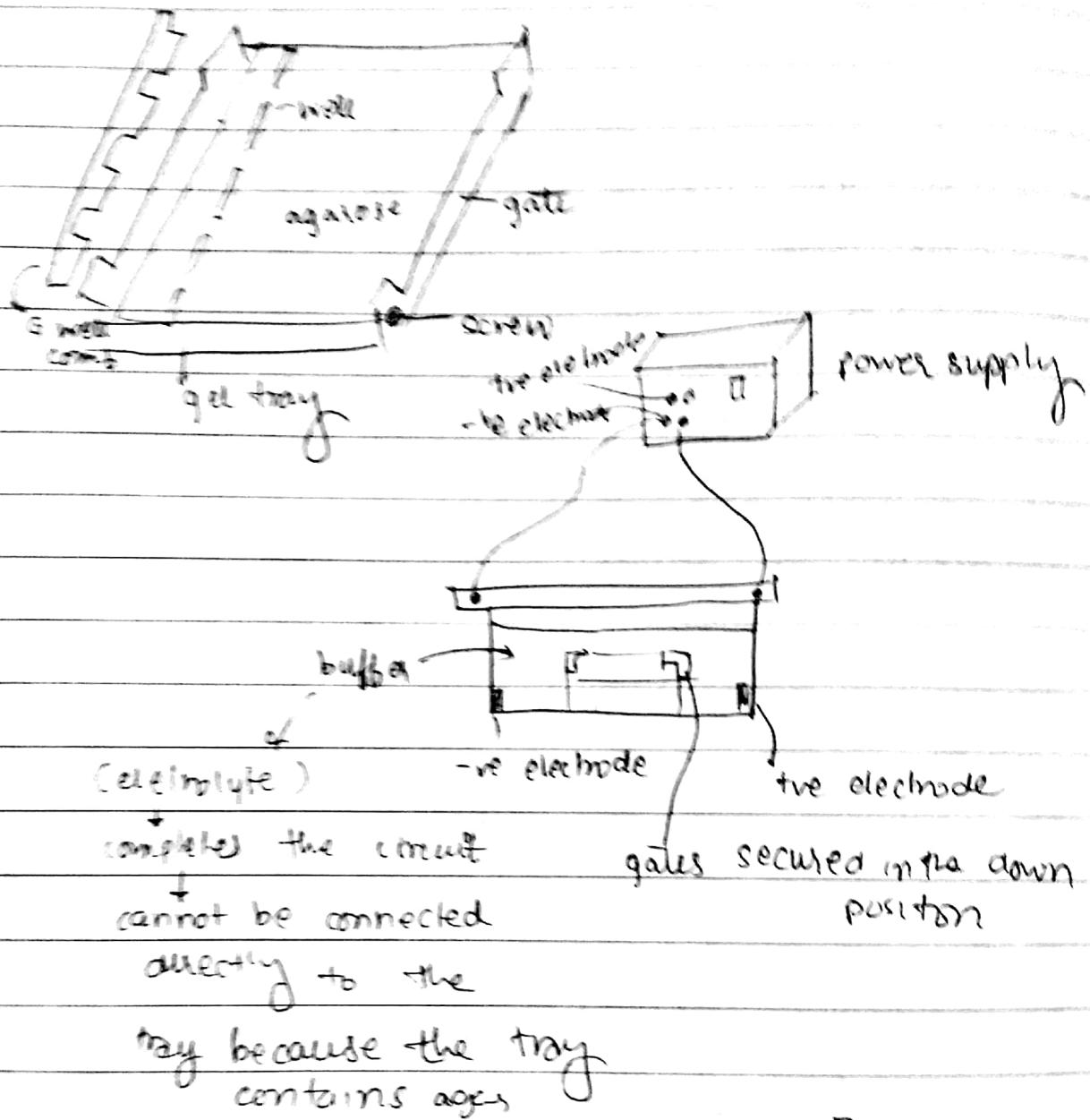
PCR (Polymerase chain reaction.)

(Exponential amplification)



Up to 3 cycles --- okay if you run too many cycles
 you might end up ~~forget~~ "losing" the
 "originality" of sample

Gel electrophoresis

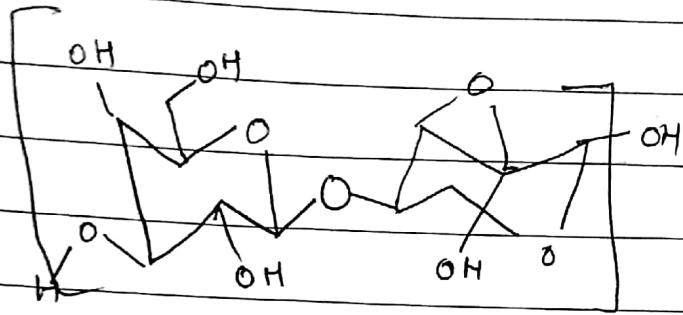
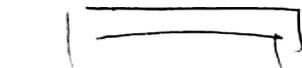


density of DNA < buffer's

• DNA should not "pop" out of the tray because of the "buoyant force"

• DNA is a marker system (

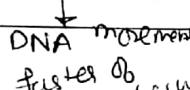
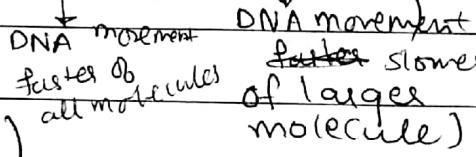
• DNA → guided movement → does not flow with the water:



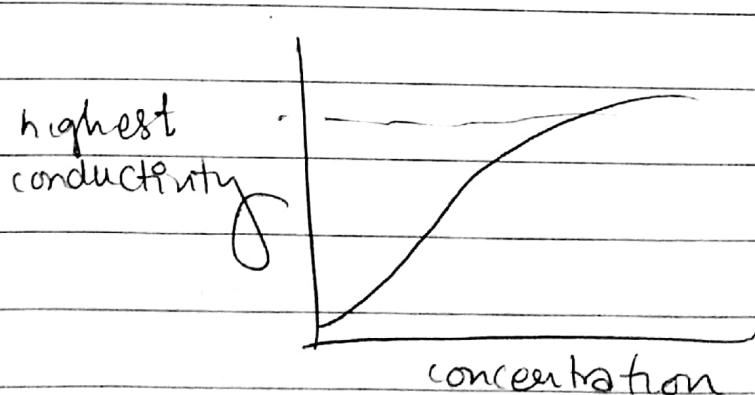
→ oligonucleotides

List out the factors affecting the movement of DNA molecule in a gel matrix.

(DNA)

- ⇒ concentration of agarose ( )
- ⇒ Higher Voltage (faster movement) 
- ⇒ concentration of electrolyte (buffer) 

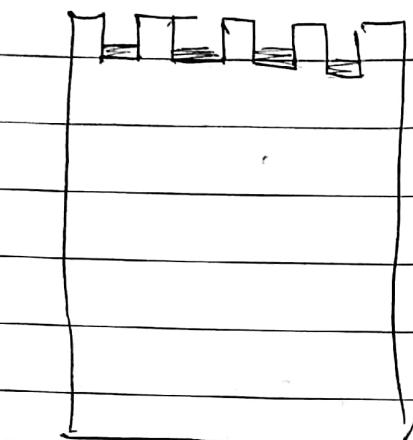
agarose → water soluble →



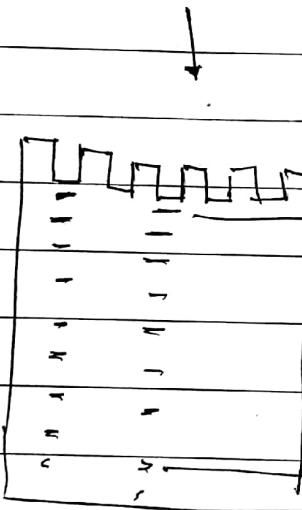
Ethidium bromide structure?

CLASSMATE
COMPOSITION

(+)



(-)



longer fragment (slowest)

shorter fragment

(fastest)

BROMOPHENOL BLUE

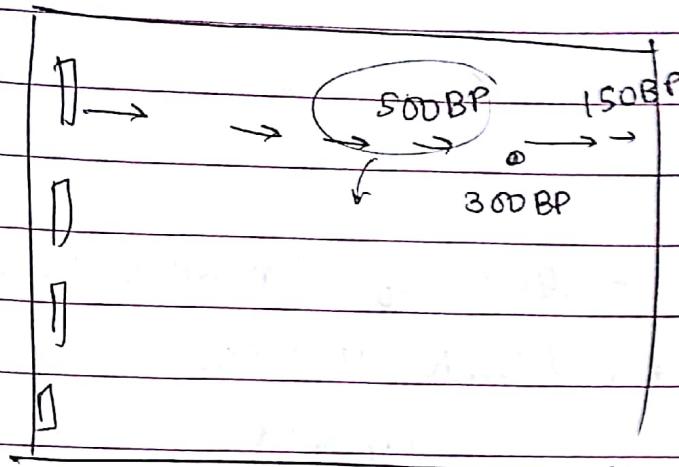
- colour (tracking DNA movement)
- highly dense molecule (sits at the bottom)

DNA might flow into the buffer if its movement restricted / controlled.

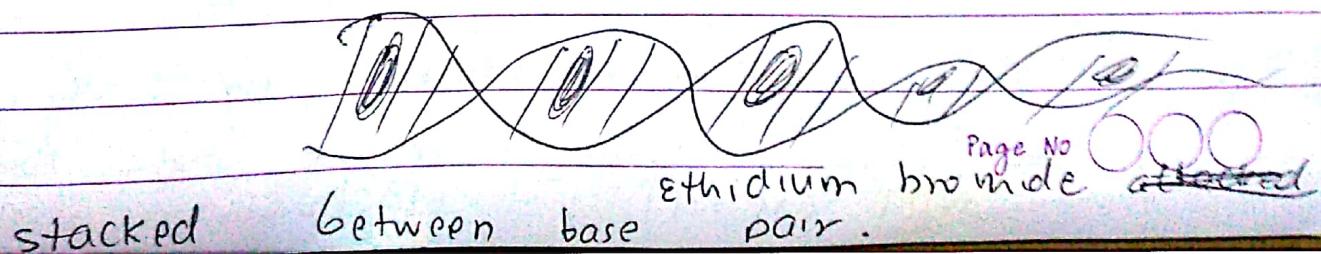
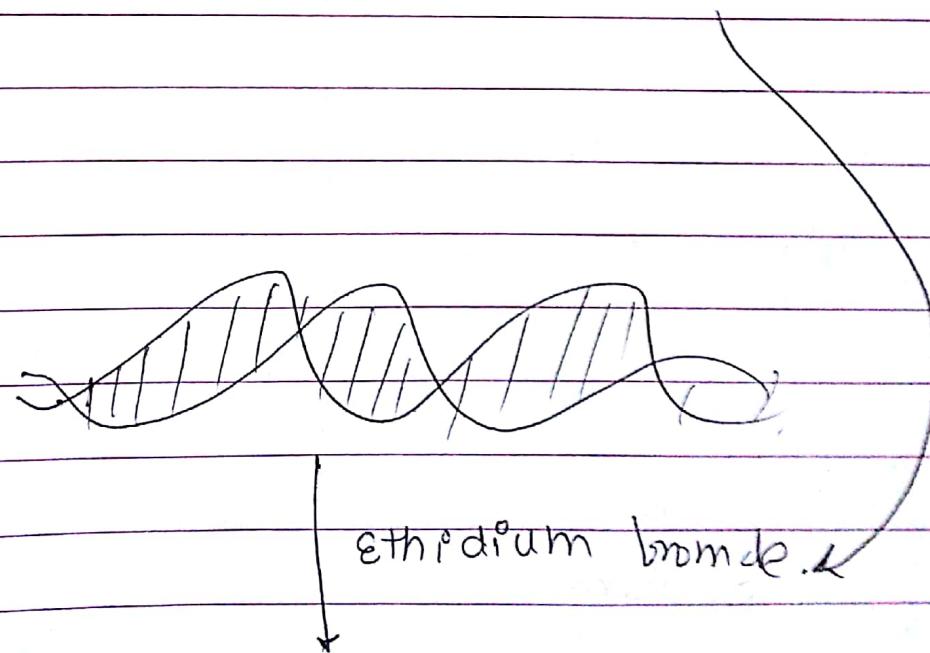
- Hence it helps

BPB = 300 base pair?

BPB = migrates at approximately the same rate as 300 BP DNA molecule.



Flo Fluorescent tag (nucleic acid stain)



Ethidium bromide (Intercalation)

- Does not form bonds per se,
just fills the void
- Intercalation

- (DNA of known sizes) on the gel
DNA ladder / DNA marker

standard

- ⇒ The company tells you all about the



Ethidium

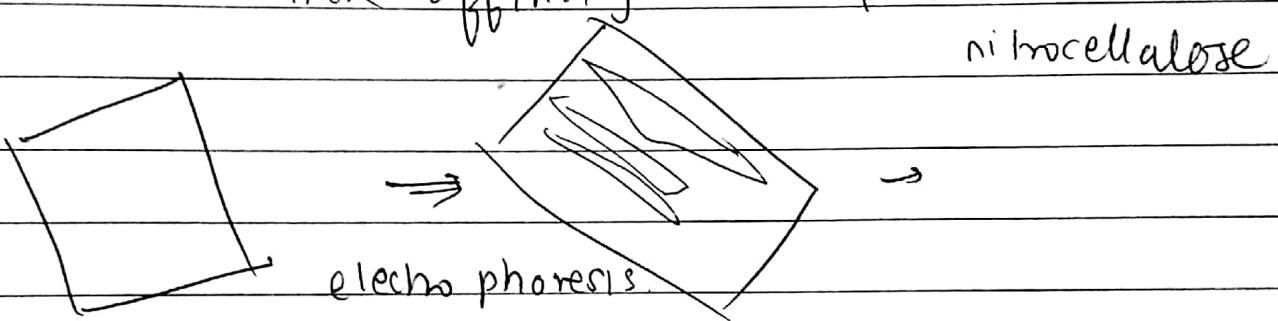
Binding between ethidium bromide &

NOT DNA double helix is Page No 000
explicitly electrostatic attraction.

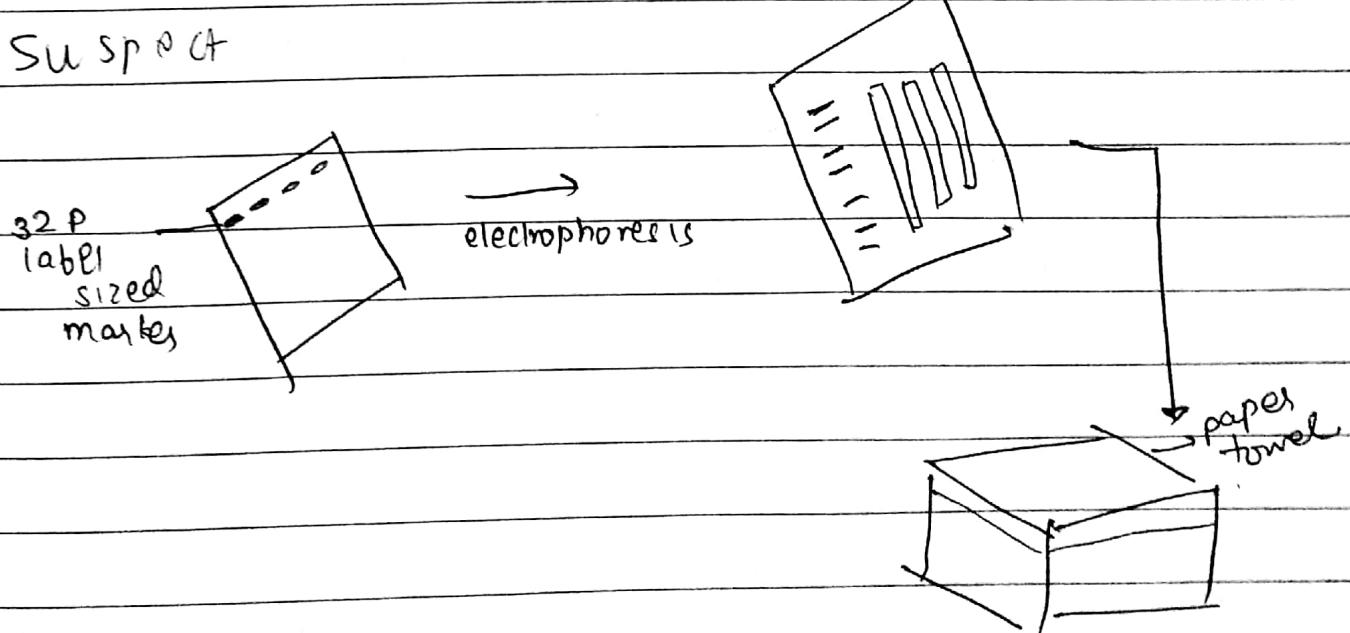
Electro

Step 3 Southern blotting

- DNA fragments obtained on gel is blotted on nylon membrane or nitrocellulose paper
- ⇒ All gels are fragile & weak
- DNA has more affinity to nylon & nitrocellulose

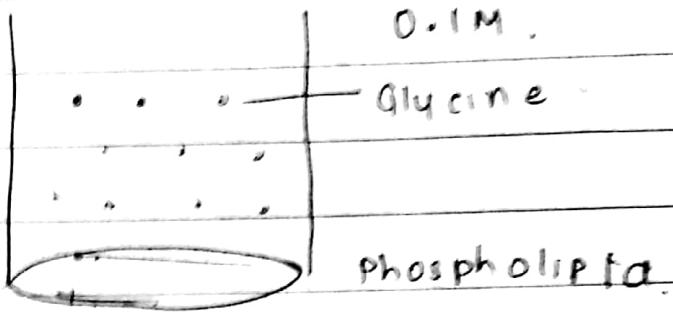


SUSP CT



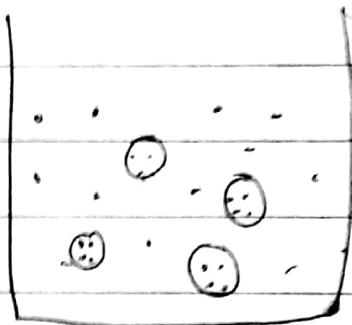
Lipid vesicles (LIPOSOMES)

(1)



↓
sonication

(2)



What is probe?

PC	1	2	3
=	-	=	-
=	-	=	-
=	-	=	-

off orthoradiography

QUIZ PORTION

29/11/18

IMP

DNA - Genetic material

What is genetic material

→ found in nucleus, mitochondria, & cytoplasm which play fundamental role in determining the structure & nature of cell substances and capable of self propagating

PNA → RNA → protein

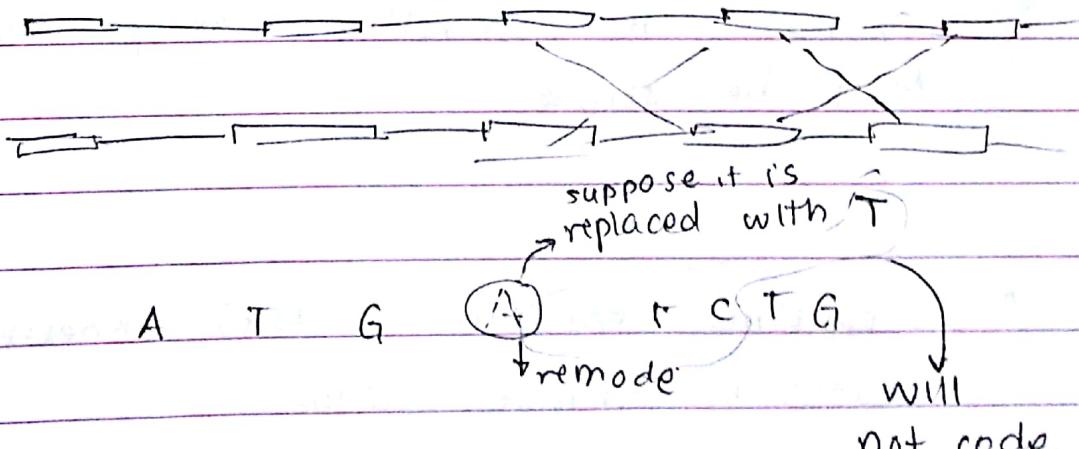
C R recombinant mutation
 ↴
 circled "strong"
 ↴
 Recon muton

A T G C T C T G

a stretch of nucleotide

A → function protein

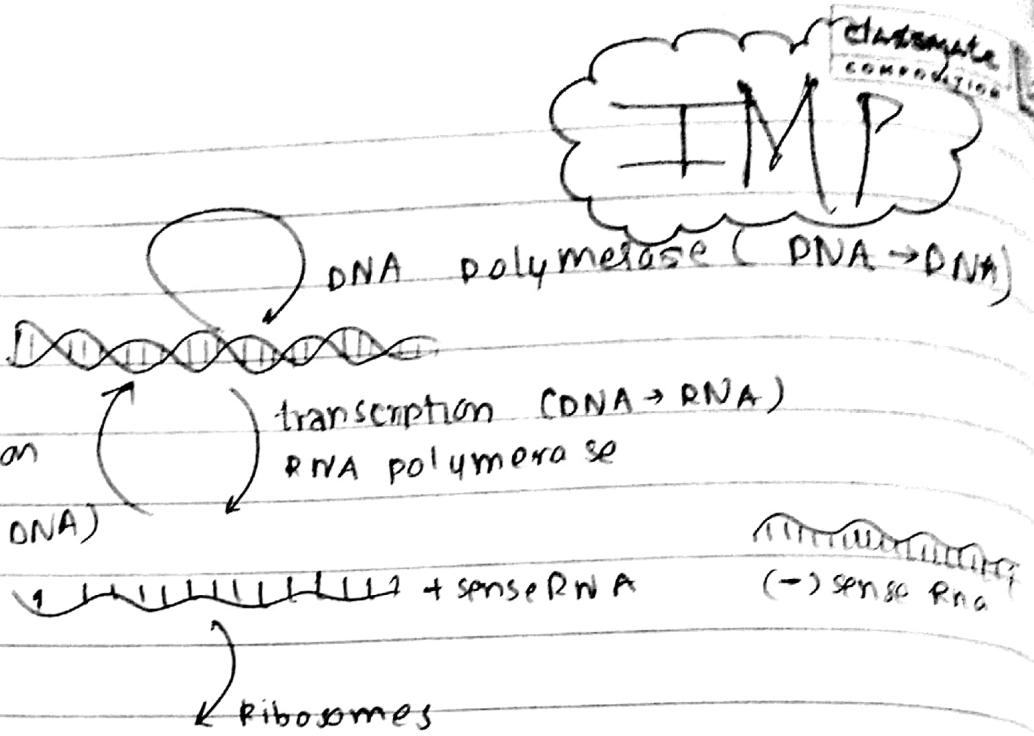
which codes for
a po



for the pre - proposed protein will code for some other protein hence hence, called mutation.

Diagrams
with
question marks
in question
paper.

Read
cautiously.



List of 5 Imp features of a

IMO

Molecule to be considered as
genetic material. It must be capable of:

- Replication (Make its copy)
- Storage of info. for expression of trait
- Control expression of traits.
- Change in controlled way (undergo mutation)
- Must be stable.
- Fredenc Griffith's (1928) experiment on bacterial transformation
- Oswald Avery

Fredrick
pneumoniae

Griffith (1928)

culture, culture media

Diplococcus
(round & 2)

Bacteria of (2) strains

Several strains of bacteria based on antigen →
1 causes disease (virulent) 1 doesn't

SII (smooth)
possesses

R II
(rough)

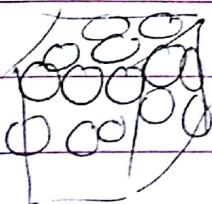
OO
Diplococci

OO
O O
OO
Streptococci

Tetrad

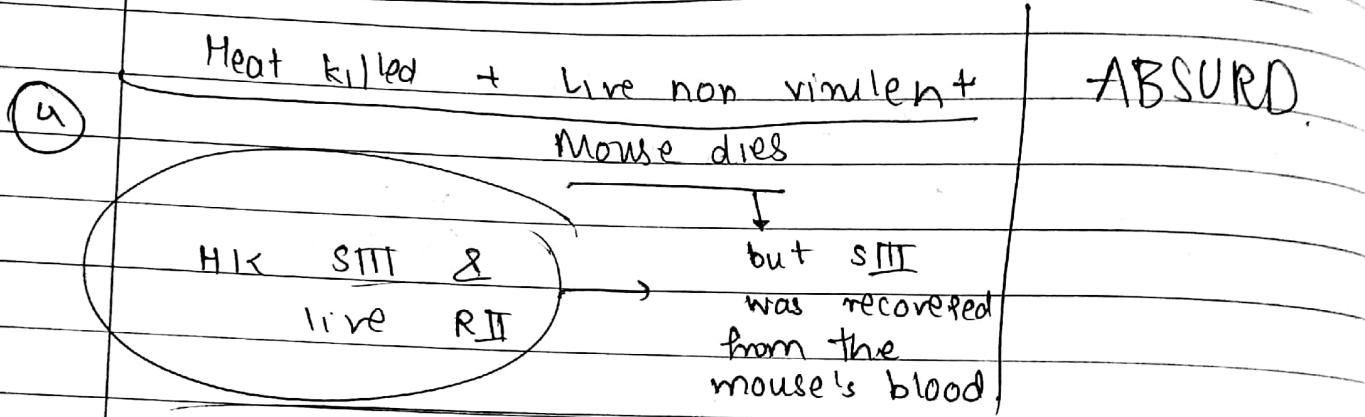
OO
OO

Senna



Remember the serotype to understand the upcoming slides type of blood strain

(1) Live virulent S. pneumoniae	(2) Live nonvirulent	(3) Heat-killed virulent
Mouse dies Live SIII	Mouse lives Live RII	Mouse lives HK SIII (heat killed)



→ The capsule is very important.

5 Mouse injected with heat killed SIII + living RII strain + DNase enzyme

→ Mouse survived. \downarrow acts on dna
breaks it
splices it.

6 Mouse injected with heat killed SIII + living RII strain + protease enzyme.
Mouse died of pneumonia
 \downarrow will splice protein

The point? \rightarrow DNA coding for whole system.

→ Protein is not leading to the death of the mouse. \downarrow protease

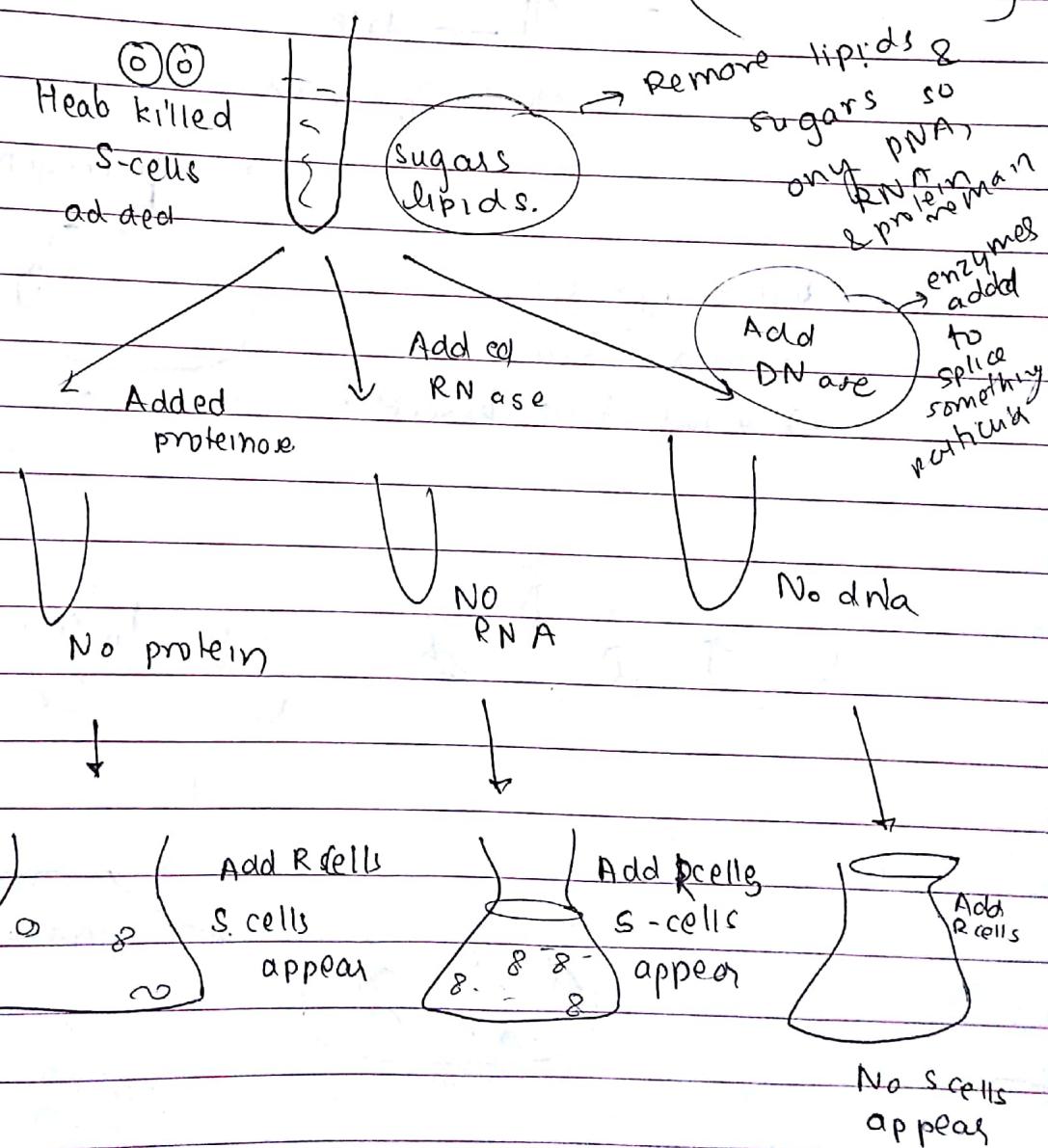
Page No. 000
added still died.

In A

 $R II \rightarrow S III$

transformation

Avery MacLeod & McCarty 1944
 Genetic material is either (DNA or RNA)



protein is

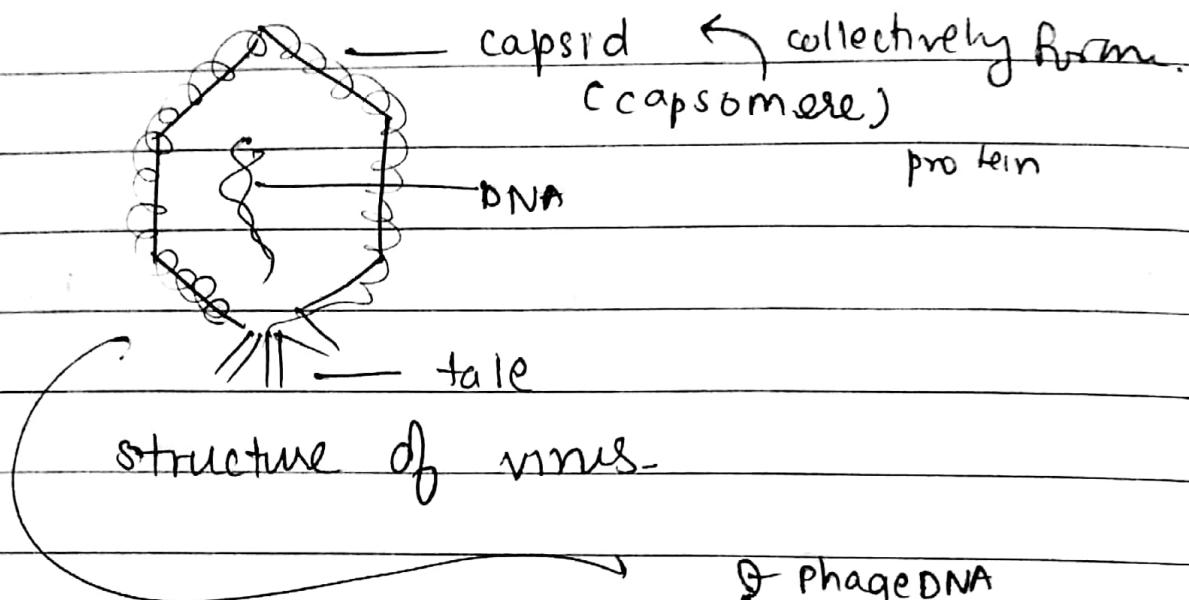
not fundamental genetic material

Page No.

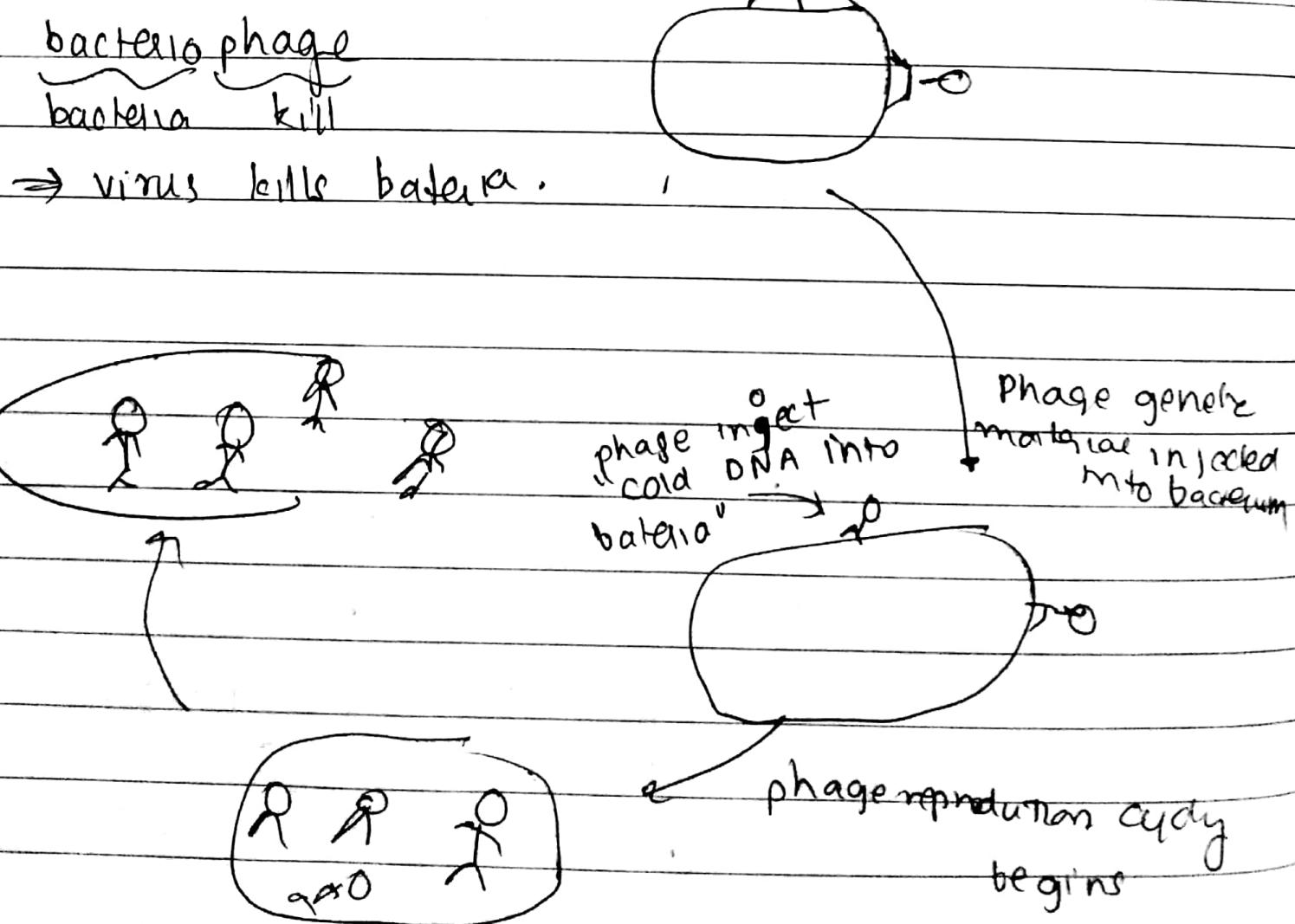
○ ○ ○

Hershey & Martha Chase 1952 investigated
bacteriophages -

ST



structure of virus-



DNA → only

↗ "injected"

When radioactive material associated with DNA is seen recursively & throughout the

^{32}P → DNA radioactive

^{35}S → Protein radioactive.

both allowed to infect bacteria.

culture plate →

culture → grown in lab conditions.

Media →