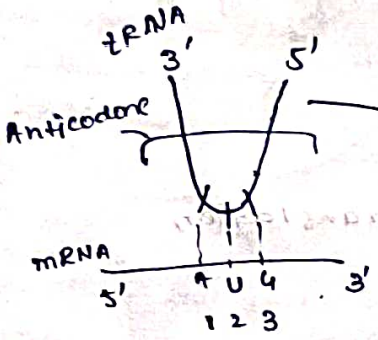
Quiz
Amino-Acid Single letter codes.
+ fill
MCQ
Strong.

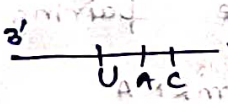
Cell Theory point

After-Midsem

DNA → Transcription → mRNA, tRNA, rRNA → Translation → Protein



Codones → Translation → Protein (amino acid sequence).



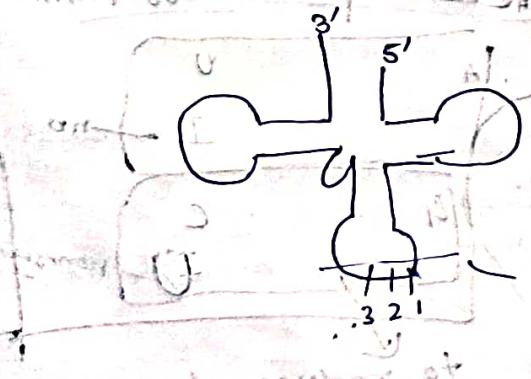
tRNA.

Anticodone - tRNA
codone - mRNA

Stop-codone :-

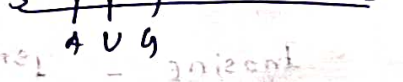
- Stop-codone are also called non sense codone.
- Start-codone : AUG
- codones are read in triplet.

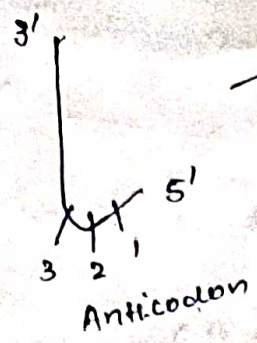
Codons - anticodon interaction / concept



Anticodon loop.

read code from 5' to 3'





L-shape
t-RNA.

Standard / watson - crick Base pair

A — T (DNA) ; V
G — C
C — G
T — A (DNA)
U — A (RNA)

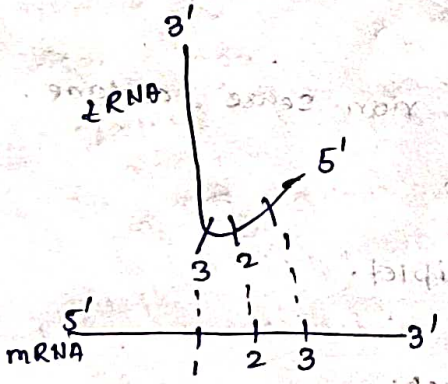
Standard base pairing

Non-standard base pairing during translation

tRNA ⟶ mRNA
└ wobbling

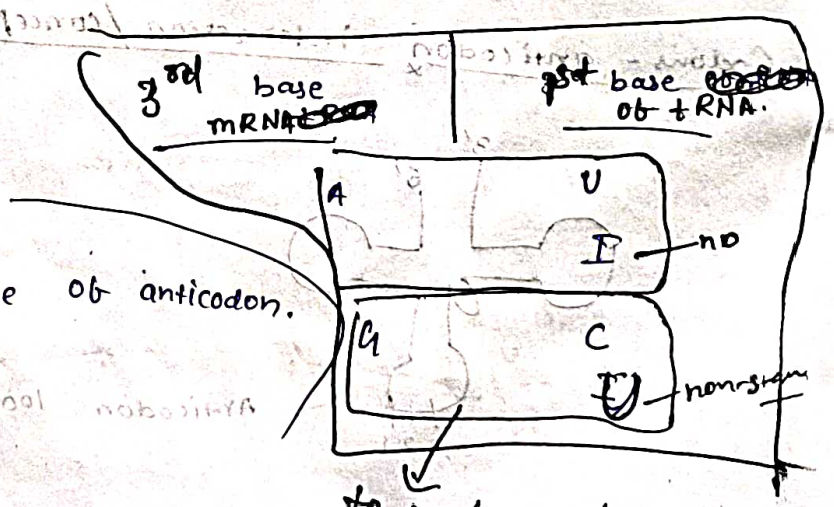
Imp. (short ✍).

1) **wobbling**



1st base of anticodon and 3rd base of ~~codon~~ mRNA

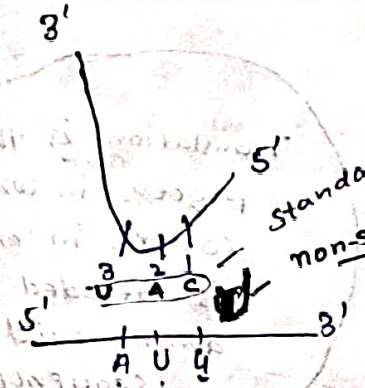
wobbling.



Inosine - 1st base of anticodon.

↓
unusal base pair

3rd base of codon	1st base of tRNA
C	G (I) — non-standard
U	A G I



Standard
non-standard — due to G:

Codon
5'- AUG-3'

Anticodon
3'- U A C -5'
3'- U A U -5'

3rd base of tRNA codon	1st base of tRNA
A	U (I)
G	C (U)
C	G (I)
U	A (G, I)

Codon :-
5'- GCC-3'

→ Possible anti-codon :

3'- C G G -5'
3'- C G I -5'

Q. codon
5'- CCU-3'

Anticodon :-

3'- G G A -5'
3'- G G G -5'
3'- G G I -5'

Q. mRNA Sequence is given

5' - AUGCUA UUA UGU AAG UGA - 3'

Write the anti-codons for 2nd and 4th codon

Soln:-

CUA 3'- GAU-5' and 3'-GAI-5'

UGU 3'- ACA-5', 3'-ACG-5' and 3'-ACI-5'

Exam:

Components involved in translation process

- mRNA
- tRNA
- Ribosomes (Intact ribosomes)
- Energy molecule (ATP, GTP)
- free amino acid.

Translation is the process in which codons in mRNA is decoded into amino acid sequence.

↓

protein translation machinary.

Genetic code features:-

- Non-overlaping (Code are read in one sequence)
- degeneracy. (One aa are code by more than aa)
- polarity (5' to 3')
- All organism follow same code. (Universality)
- Non-ambiguous (All GG - condon will code for aa).

feature

Degeneracy

1 amino acid is decoded by more than one codon.

e.g. UCA
UCU
UCC
UCG
AGU
AGC
Serine codons

Except two codon all codon show degeneray

Met
Trp.

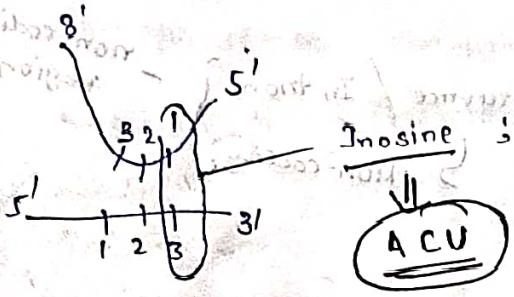
Objective Q Related to tRNA

1) Anticodons ← 1st position of anticodon.

2) Inosine / Non-standard base found in Anticodon.

3) aa at 3' - end ester bond high energy.

4) tRNA → (attached with aa) → aminoacyl tRNA
↳ activated tRNA / Charged tRNA.

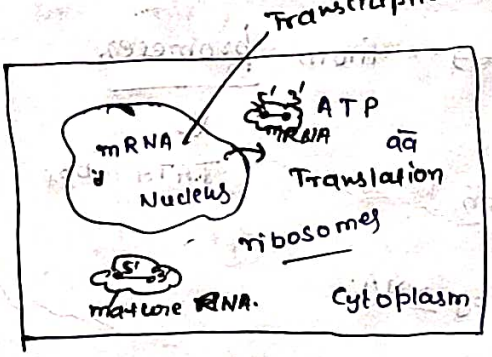


: 1st position of anticodon.

Q. How many codon and b.p required to form a hexapeptide sequence?

Hexapeptide = 6 aa
1 codon = 1 aa
6 aa = 6 codon.

Protein coding gene structure at DNA level



Transcription : inside nucleus
Translation - Cytoplasm.

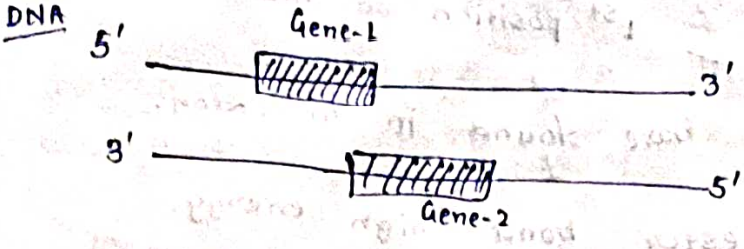
Post - transcriptional Processing :-

1) 5'- capping - 7 methyl guanosin attached with 5'-5' triphosphate linkage.
• Enzyme :- Guanylyl transferase.

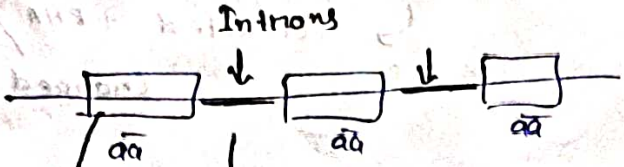
2) Polyadenylation → poly - A - tail
• adenine nucleotide at 3'end [addition]
• Enzyme : Poly - A - polymerase.

3) Splicing

Splicing



AUG CAU AAC UGC - - - - → It contain some codon which don't code for any aa



Intervening Sequence / Introns → Non-coding → non-coding region

Exons → coding region → codon which code for aa

→ Splicing is a process which joins the Exons and remove Introns.

Enzyme :- Spliceosomes

Diagram slides

Protein coding gene → (code for) → mRNA.

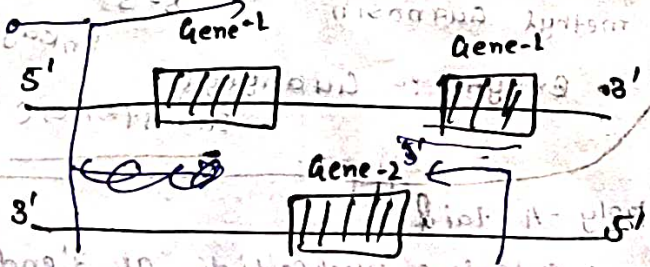
Transcription Start site → from promoter.

TATA box

UTR - Untranslated region → Recognize by tRNA.

parameter = -10bs → i.e Tata box - is 10 bp away.

Q.

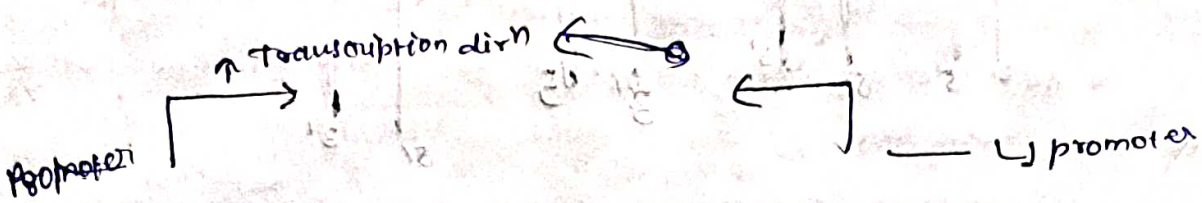


for Gene-1.

promoter box ← upstream

for Gene-2

promoter → downstream.



Q. Which phase of transcription does ribonucleotides added?

a) Initiation → Promoter → TATA Box (Bound with RNA-polymerase -II).

~~a~~ elongation Enzyme :- RNA polymerase II

a) Termination

Direction - 5' ——— 3'

↳ Because 3' have free -OH group.

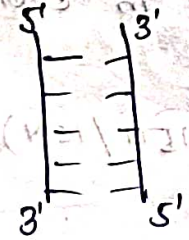
Transcription

Phosphate group

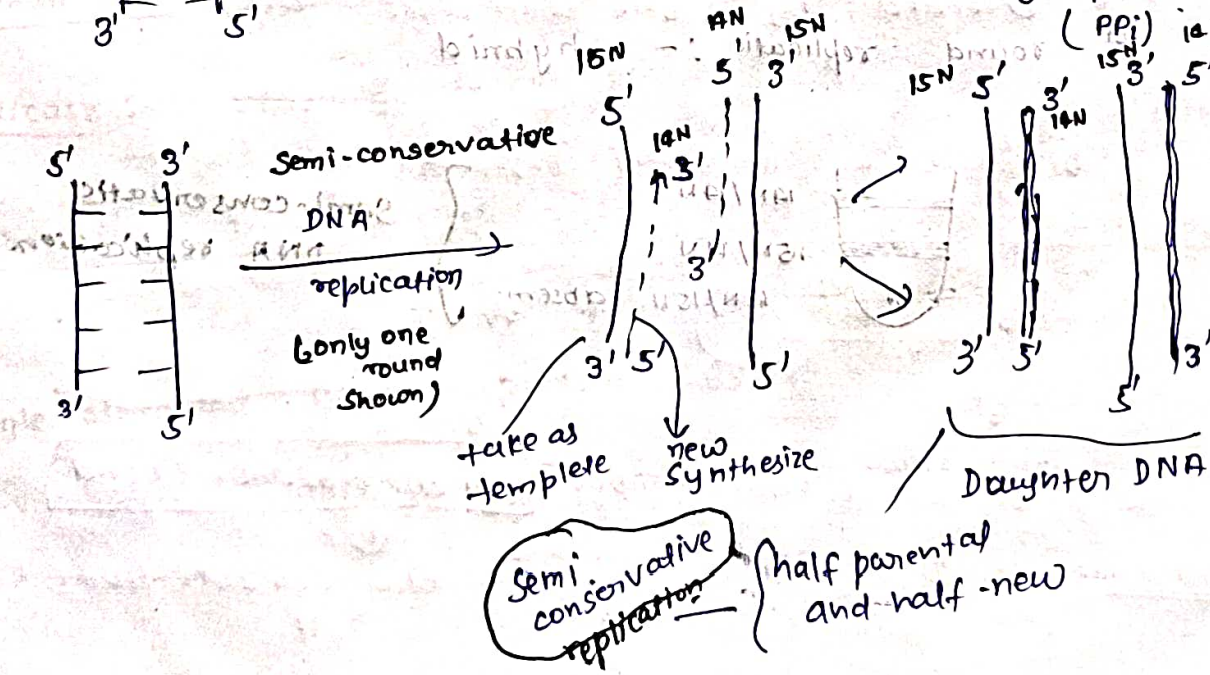
DNA Replication

1) Synthesis - S-phase

DNA replication :- process of making daughter molecule from parental DNA.

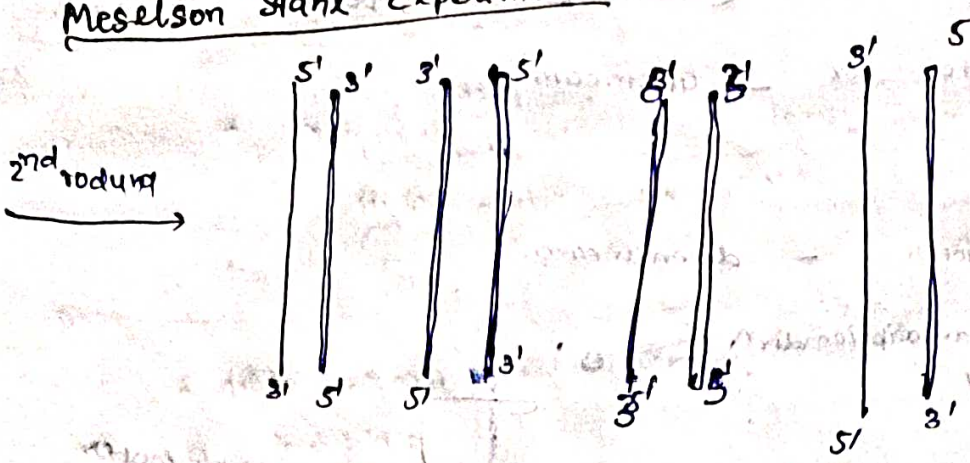


$(dNMP)_n + dNTP \longrightarrow (dNMP)_{n+1}$ + Pyrophosphate (PP_i)



Semi conservative replication → half parental and half -new

Meselson Stahl Experiment



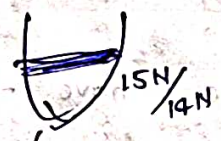
N^{15}

N^{14} Bacteria for culture.

^{15}N Medium → for replication

Density gradient gel.

Transfer Bacterial cell to ^{14}N medium



Shift in band { Density gradient gel

Intermediate DNA / hybrid DNA.

Half of daughter molecule → hybrid

half light weight $^{14}N/^{14}N$.

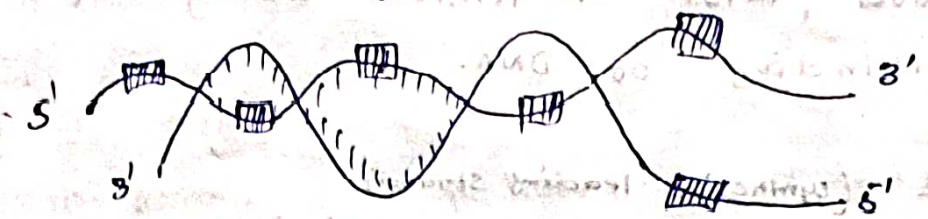
^{15}N DNA → parental DNA { conserved in every round }

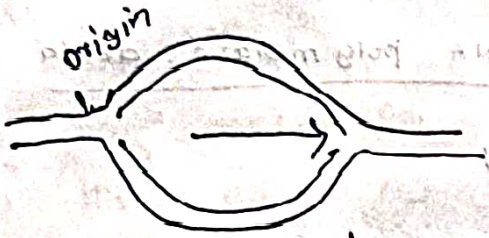
2nd round replication :- 50% 50% ($^{15}N/^{15}N$)

1st round replication :- hybrid

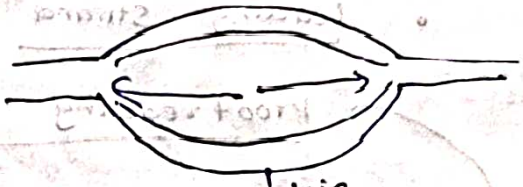
} Semi-conservative DNA replication.

Ori (origin of replication)



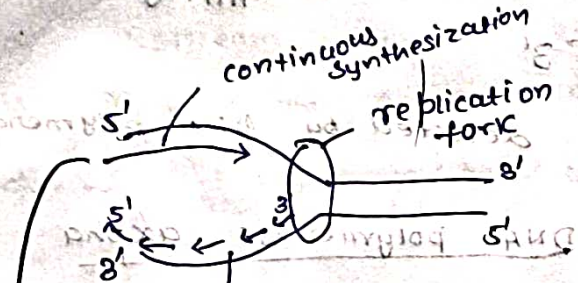


Unidirectional replication



Bidirectional replication

Many replication bubbles are formed during Bidirectional replication



} - discontinuous synthesization.

Okazaki fragments

Short Q. What is difference b/w continuous and lagging strand?

Mechanism of DNA replication and enzymes involved

① Helicase :- removing helical structure of DNA

⇓

Breaking H-bond (Unzipping of DNA molecule)

⇓

Between bases of molecule at Ori site.

Single stranded Binding protein (SSBs) :-

⇓

Stabilizes the unbound parental DNA.

⇓

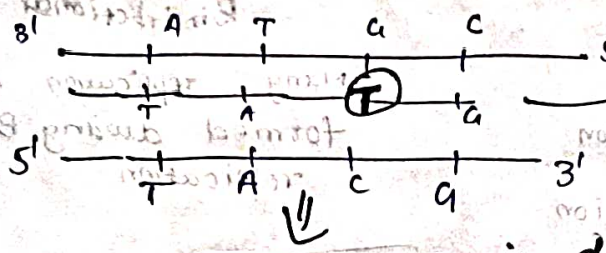
Topoisomeras → Helicase

- removes the twist → tension during the unwinding of DNA.

DNA polymerase (synthesize leading strand)

- Add deoxy ribo nu cleo tides taking one strand as a template
- Leading Strand → DNA polymerase delta

Proof reading activity



structure is not fitting.

This mismatch is detected by DNA polymerase.

- Lagging Strand → DNA polymerase alpha

Primase

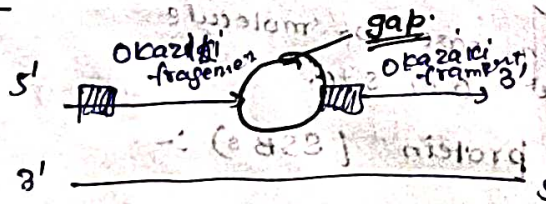
- An enzyme works like RNA polymerase (mRNA formation ⇓ RNA polymerase use.)
- 5 to 10 ribonucleotides is added ⇒ primers

Short primers Synthesis

- Extended by DNA polymerase - alpha

Discontinuous fragments ⇒ Okazaki fragment.

DNA ligase



gap will be filled by ⇒ pho & pho diester bond

B/w okazaki frament.

enzymes:- DNA ligase

DNA polymerase epsilon

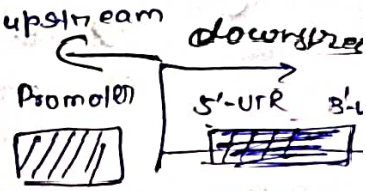
c) Replace the RNA primere

11 Oct

Q. If AUG is a start codon, a polypeptide of five amino acid is synthesized in eukaryotic cells. which of the following is a correct polypetide ?

a) Gly - Met - Val - his - lys
b) Met - Val - Gly - his - lys — because AUG will code for Methione
c) His - Val - Met - Gly - lys

2). where do you find the promoter ?



a) upstream of a coding gene
b) Downstream of a coding gene.
c) In 5'-UTR or 3' UTR.

3. A single DNA molecule (parental) undergoes 3 rounds of replication then how many DNA molecule present will contain one parental strand.

Semi-conservative model.

a) 2
b) 6
c) 8
d) 4

Q. how many DNA molecule present don't have parental strand.

a) 2
b) 6 — (2-parental + 6 Non-parental)
c) 8
d) 4

1st round - 15N/14N (2)
2nd round - 15N/14N, 14N/14N.
3rd round - 15N/14N, 14N/14N, 14N/14N, 14N/14N

Gene Expression

DNA (gene) $\xrightarrow{\text{Transcription}}$ mRNA $\xrightarrow{\text{Translation}}$ poly peptide

(Splicing)

means → to make protein from gene.

Gene Expression involes :-
(i) Transcription
(ii) splicing
(iii) Translation

Gene → A coding segment of DNA
→ One Transcription unit
→ Inheritance factors which is transfered from one generation to another.

Pattern of Inheritance

female - 44 + XX (genotype)

Male - 44 + XY (genotype)

Parental Generation

XX — double dose of X-chromosomes

XY — Single dose of X-chromosome

Gametes -

Miosis → X X X X

Miosis → X X Y Y

↓

Fertilization

fusion.

Gametes (Ovum) → / male ↓	X	X
X	XX	XX
Y	XY	XY

Haemophillia

H → A person is normal not haemophillic

h → A person is haemophillic

(Blood is not clotted when a haemophilic person).

factor - VIII → Fibrinogen → fibres.

factor - VIII is not forming in haemophilia person

⇓

fibrinogen not formed

⇓

Blood not cloated.

normal allele

H — normal

h — haemophillia.

Mutated allele

female → / male ↓	X^H (Normal)	X^h (Mutated)
X^H	$X^H X$	$X^h X$
Y	$X^H Y$	$X^h Y$

Inheritance pattern — only one X^H can not blood.

female carrier 44 + $X^H X^h$

Q. A carrier ~~haemophillic~~ women is married to a normal man. Show with the ~~punnet~~ square, the inheritance of haemophillic gene.

Female - $X^H X^h$ · Male - $X Y$

F / M	X^H	X^h — Female
X^H	$X^H X$	$X^H X^h$
Y	$X^H Y$	$X^h Y$

$X^H X^h$ — possibility of one-daughter as carrier.

$X^h Y$ — One affected son.

$X^H X$ — One normal daughter and Son.

4 Haemophillic affected women marry a normal man.

double dose of X^h

F / M	X^h	X^h
X^H	$X^H X^h$	$X^H X^h$
Y	$X^h Y$	$X^h Y$

— All sons are haemophillic

100% chances

Colour Blindness – Red and Green

women carrier of colour blindness

C normal allele c – mutant allele (small).

F / M	X^C	X^c
X^C	X^CX^C	X^cX^C — carrier
Y	X^CY	X^cY — color blind

$X^C \Rightarrow X$ or X^+ – normal allele.

12/10/23

Q. A primary mRNA transcript of chicken ovalbumin gene is 7700 nucleotides long. The nature mRNA translated was 1700 nucleotides long. Why this size difference of nucleotides?

a) 5'- capping

b) Poly-A-tail

c) RNA splicing (introns removed).

X-linked Inheritance

Genes which are present on sex chromosomes

X, Y chromosome

→ X - chromosome

→ X-linked genes

e.g. colour blindness, haemophilia

→ X-linked Inheritance.

Genotype – Genetic make up of an organism

e.g. Carrier for haemophilia gene

→ X^hX — carrier Genotype

X^HX^H — normal genotype

Affected male — X^hY — Genotype

Female X^hX^h — double dose

Plant → Gregor Mendel on Pea plants

→ Tall pea plants

↓ ↳ Phenotype (characters we can see).

'T'

T T/t

Gene

1 Gene — 2 allele. ↓ ↳ T, t.

T, TT, Tt, tt — Genotypes

A [Dominant / Recessive]

Purple flower

'P' (gene responsible)

normal allele

DNA → mRNA → translate → Pigment — functional enzyme → purple flower → anthocyanin

normal allele

p mutant allele ⇒ doesn't form anthocyanin

White flower

Genotype- 'P P' 'Pp' 'pp'

Phenotype- purple purple white

P - dominant

↓ masking effect of P

p - recessive.

↓ one 'P' is enough to make anthocyannin

Genotype- 'TT' Tt 'tt'

Phenotype- Tall Tall dwarf/short

T - dominant

t - recessive

Cross breeding { TT x tt ⟶ Tt → all tall

Tt x Tt ⟶ TT, Tt, tT, tt,

3:1 ratio of tall.

X-linked

$X^h X$ — 'h' - recessive

$X^h X^h$

X - linked recessive Theritance

eg. haemophilia, colourblindness

not required — gg $X^D X$ - cause deases.

↳ X-linked dominant.

Homozygous

Heterozygous

XX

TT

↳ homozygous genotype

Tt, tT

heterozygous genotype.

tt

dwarf plant.

$X^h X^H$

XY

Parents $I^O I^O$ $I^O I^O$

Toshit - O

Genotype - $I^O I^O$

gg sister have I^A

then any parents have

$I^A I^O$ $I^O I^O$.

Blood group - 'ABO' allele

Enzyme :- N-acetyl galactosamine transferase.

A antigen

N-acetyl galactose

Codominance

Blood group - A

B

AB

O

Both A & B present

codominance.

allele.

Controlling AB blood

Chromosome - 9

(I) - Blood group present.

A → $I^A I^A$; $I^A I^O$
Homo Hetro

B → $I^B I^B$, $I^B I^O$

O → $I^O I^O$

O - doesn't form enzyme.

AB → $I^A I^B$ only one Genotype

O → $I^O I^O$

Q. Blood group of father 'A' and mother 'B', what will Expected Blood group of progeny?

a) AB, A

b) O, A, B

c) A, B, AB, O

$I^A I^O$ × $I^B I^O$

$I^A I^O$, $I^B I^O$, $I^A I^B$, $I^O I^O$

Human physiology - Cardiovascular System

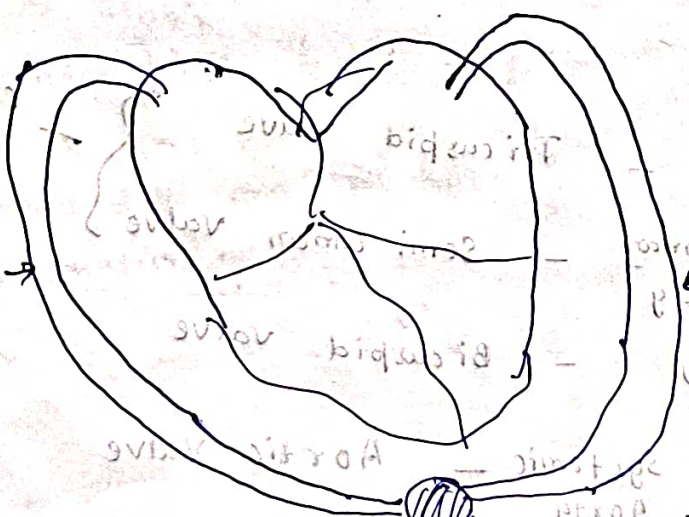
heart blood

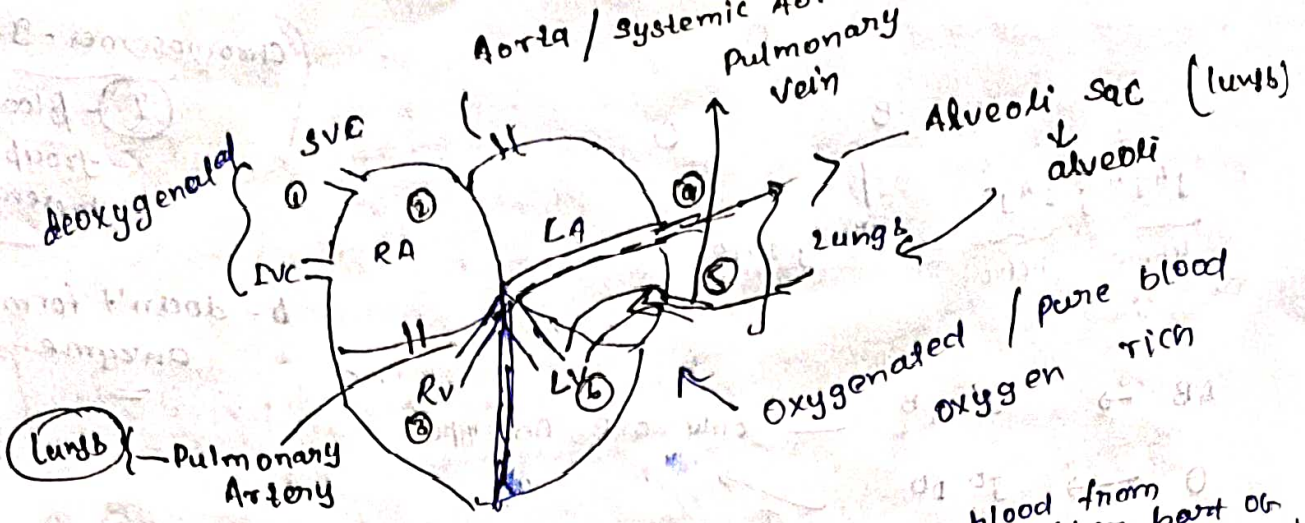
- Circulatory
  - circulation of blood and lymph

→ Blood Vascularory System :- Blood vessels → Arteries, Veins

→ Lymphatic vessels,

Arteries → Arteriole
Veins → Venules
} Blood capillaries → efficient time to exchange nutrients, CO_2.





1) Large vein
   a) Superior vena cavae — (carry blood from upper part of body)
   b) Inferior vena cavae — (carry blood from lower part of body).
   c) Coronary Sinus → (heart vein).

Pulmonary vein
— carry oxygenated blood from lungs to heart

Pulmonary artery
— Carry deoxygenated blood from R.V of heart to the lungs.

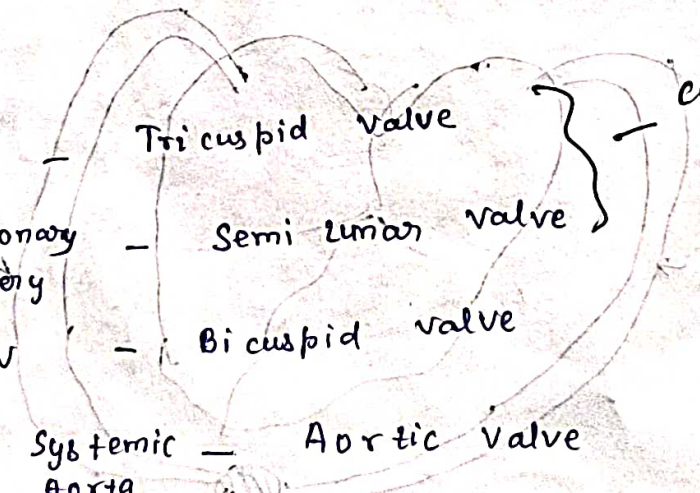
Vein — associated with deoxygenated blood.

Path of blood flow

from different parts of body → Vena cavae → RA → (Tricuspid valve) → RV → (semi-lunar Valve) → Pulmonary Artery → lungs → Pulmonary veins → LA → (Bicuspid valve) → LV → Systemic Aorta → to different part of the body

(Aortic value)

Valve



B/w RA & RV — Tricuspid valve
B/w RV & Pulmonary Artery — Semi Lunar valve
B/w LA & LV — Bicuspid valve
B/w LV & Systemic Aorta — Aortic Valve

— closing of these value create sound.

Lubb - Dubb

→ Right Atrium and Left Atrium contraction

↓ Tricuspid and Bicuspid valve close

Right and Left Ventricles (Lubb)

contraction of Ventricles

Right Ventricle to lungs via pulmonary artery

Left artrium to left ventricle to Systemic aorta

↓

Closing value — Semilunar valves closed

(Dubb).

Closed type of Circulation.

In a channel — Blood vessels

→ Path of blood flow

→ → → → → → →

→ closed type.

Human, Blood flow → Double circulation

Double circulation

a) Pulmonary circulation

↳ • Deoxygenated blood from different parts goes to lungs via pulmonary artry.

• Oxygenated blood from lungs to heart via pulmonary veins.

(b) Systemic circulation

↳ oxygenated blood from Aorta to Artioles different parts of body. (outside the hearth).

Exam:

Q. path of blood and its type.

Q. Double circulation ?,

1) Protecting Covering of heart

↳ pericardium :-

↳ Three layer

- Epicardium
- Myocardium :- Thick cardium muscle, Conduction of heart beat
- Endocardium

Heart beat

1) 72 times per minute

↳ 72 times - lubb & Dubb sound.

70-80 beats.

- Size of heart :- 12×9 cm
- weight of heart - M - 300 gm
  F - 250 gm

18th Oct
Biology

Two atria → separated by interatri
two ventricles → " "

Exam:
Difference b/w arteries & veins.

Cardiac muscle of heart. - conduction system of the Heart.

Sinoatrial node
↓
AV node
↓
Bundle of HIS
↓
Bundle branches
↓
Purkinje fibres.

not controlled by nervous system.

Action - potential
↳ Membrane depolarized

Cardiac muscle have potential to create Action - Potential

Contracts
Contraction of muscle fibres.

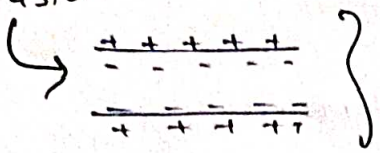
Systole (contraction) when membrane start deplorized.

Imp Slides.
Properties of cardiac Muscle fibres

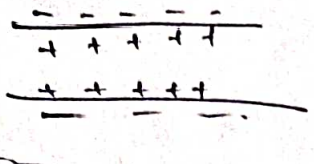
parasympathetic and sympathetic.
Both work as Opposite.

Cardiac output = beat per minute x how much blood blood pump per min
= 72 x 70 ml. (per beat).

Diastole - relaxation



Resting / depolarize



depolarized

Cardic cycle Slide

Joint Diastole → relaxed state atrium and ventricle.

Cardiac cycle - 0.8 sec

- Atrial systole - 0.1 sec
- Ventricle systole - 0.3 sec
- Ventricle diastole - 0.4 sec

0.8 sec.

Cardiac Output = Stroke volume x heart rate

- Stroke volume: 70 ml/beat
- heart rate: 75 beats/min

5.25 litre/min.

Systemic circulation

- Coronary circulation
- Cerebral "
- Hepatic portal "

related to liver

19/oct

Respiratory System

- Passage for O_2 and CO_2 transport
- Regulating the pH of the blood
- Organs of Respiratory system

fine hairs → Nasal cavity → Pharynx → larynx → Trachea

fine hairs filter the air

cilia

Nose → Nasal cavity → Pharynx → larynx → Trachea

Conductive zone

Trachea → Bronchi → Bronchioles → Alveolar ducts → Alveoli (Alveoli sacs)

Respiratory zone.

Gas will be exchanged.

Lungs.

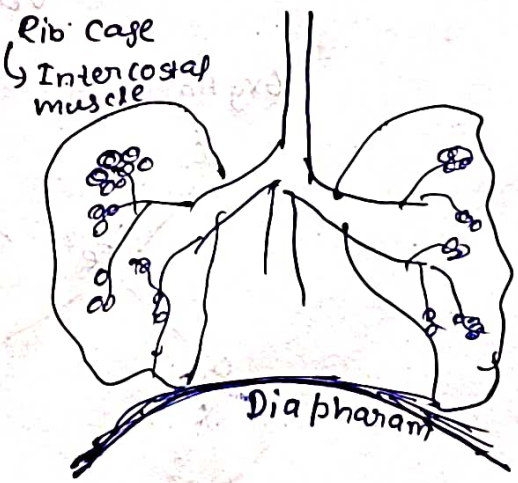
Alveoli
↳ functional unit of Respiratory system

pO_2 in alveoli 104 mm Hg.

pCO_2 in alveoli 36-40 mm Hg.

Partial pressure difference.

Zone of Respiratory system
1. Conductive zone
2. Respiratory zone



Respiratory process

1) Pulmonary Ventilation
(Breathing)

- Inhalation & Exhalation

When we inhale - (Intercostal) muscle contract.
- Thoracic activity increase
- Diaphragm down.

When we exhale
- muscle relax
- Diaphragm upward.

Inhalation

→ Diaphram – downward movement
Intercostal muscle – contract

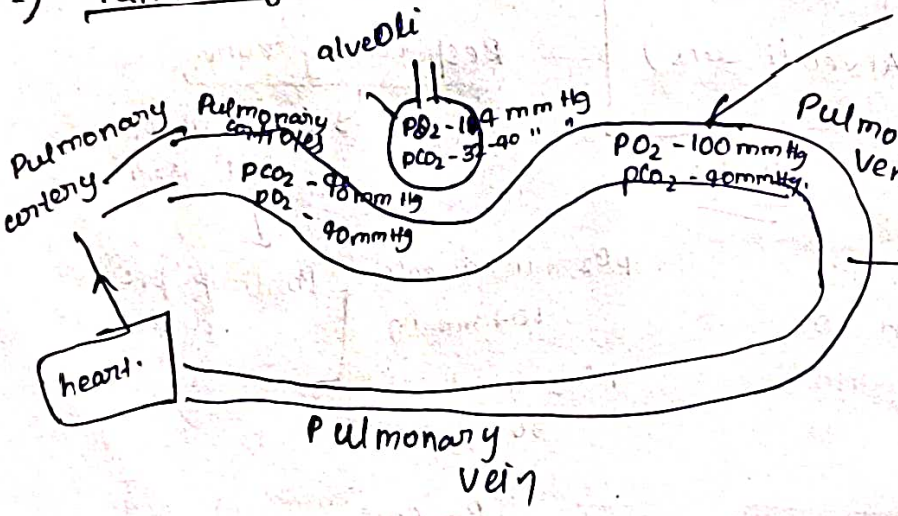
} Volume of Thoracic activity ↓ Air is pulled in the lungs.

Exhalation

Diaphram – upward
Intercostal muscle – Relax

} Air is pushed out.

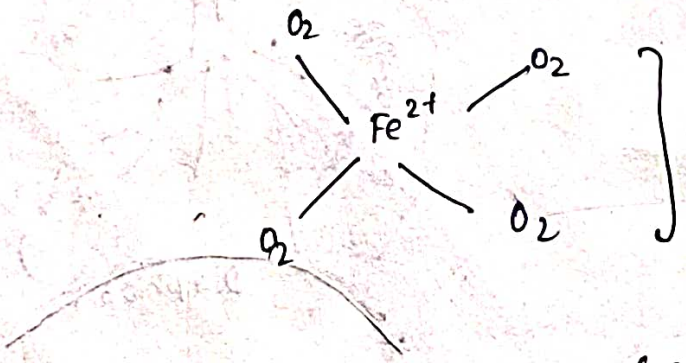
2) Pulmonary Exchange of Gas



100% saturation
$Hb + O_2 \rightarrow HbO_2$
(Haemoglobin) Oxy-haemoglobin

Blood has haemoglobin high affinity for O_2.

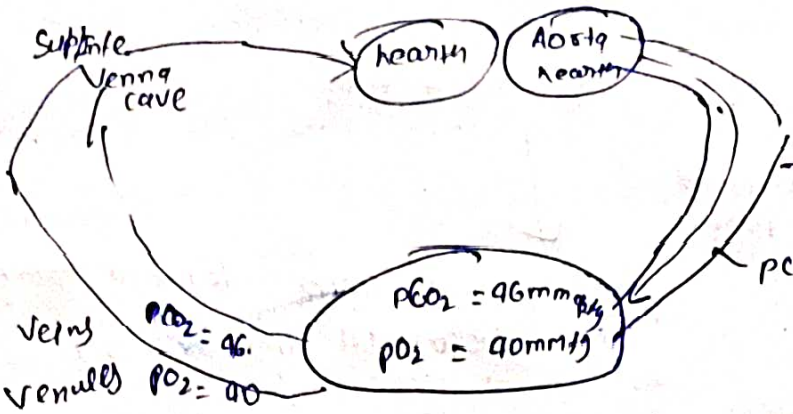
Oxy-haemoglobin → 98 %



100% Saturated haemoglobin.

3) Systemic Exchange of Gas

Gas exchange is between Body tissue and Blood of Systemic circulation



Date
25/10/23
Exam Imp.

Q. What is pulmonary and systemic exchange of gases (1.5 marks)

— Pulmonary Exchange

Lungs alveoli and the blood in pulmonary arterioles.

(fig) . (Diffusion of gases due to P.P differ.

Systemic Exchange

↳ show Body tissue pCO_2 & pCO_2 exchange

Oxyhaemoglobin
100% saturated.

Imp.
b). Graph - oxygen dissociation

Imp.
How
c) CO_2 is transported. (slides)

CO_2 transport

(i) In dissolved state in plasma

(5-7 %) is transported in dissolved state.

$CO_2 + H_2O \xrightarrow[\text{slow}]{} H_2CO_3$ (in plasma)

↳ due to this, some CO_2 directly cross into plasma.

In RBC,

$CO_2 + H_2O \rightarrow H_2CO_3 \rightleftharpoons H^+ + HCO_3^-$

(fast as compared to plasma.)

Carbonic acid formed immediately dissociates into (HCO_3^-).

Chloride Shift

The shift that maintain the ionic balance b/w blood plasma and RBC cytocell.

$Na + HCO_3^- \rightarrow NaHCO_3$.

70% CO_2 is transported in the form of bicarbonate ion.

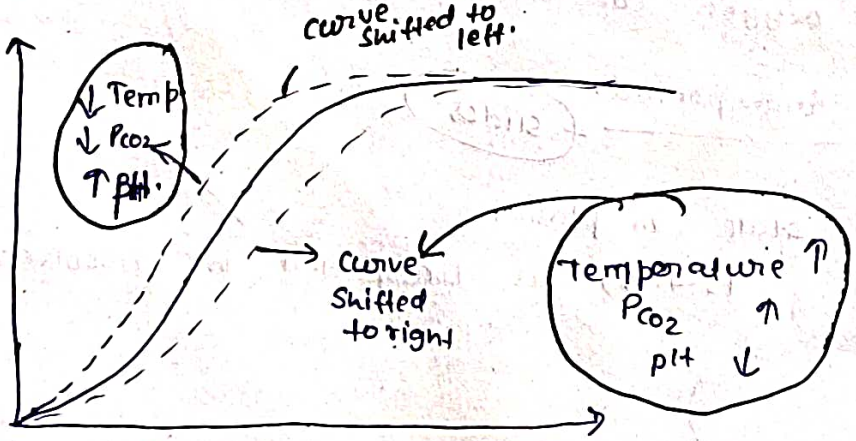
→ when HCO_3^- comes out Cl^- diffuse and maintain balance.

HHb (Haemoglobinic acid) helps in buffering excess H^+ ions and allowing O_2 to be released.

Slides graph Imp.

Bohr's effects

(Oxygen haemoglobin dissociation curve.



Gold Imp. Slide

Draw graph

Q. During the CO_2 transport the ionic balance between plasma and RBC is maintained by :-

Ans :- Chloride Shift.

Q. Effect of CO_2 and H^+ on the affinity of the Oxygen with Haemoglobin.

a) Chloride effect

b) Bohr effect

Nervous System

- Brain
- Spinal cord

] Central Nervous System

Nerves fibres
↳ ganglia

] Periphery Nervous System

- Motor Neurons → from CNS to skeletal muscles only
- Sensory Neurons → Carry info to the CNS.

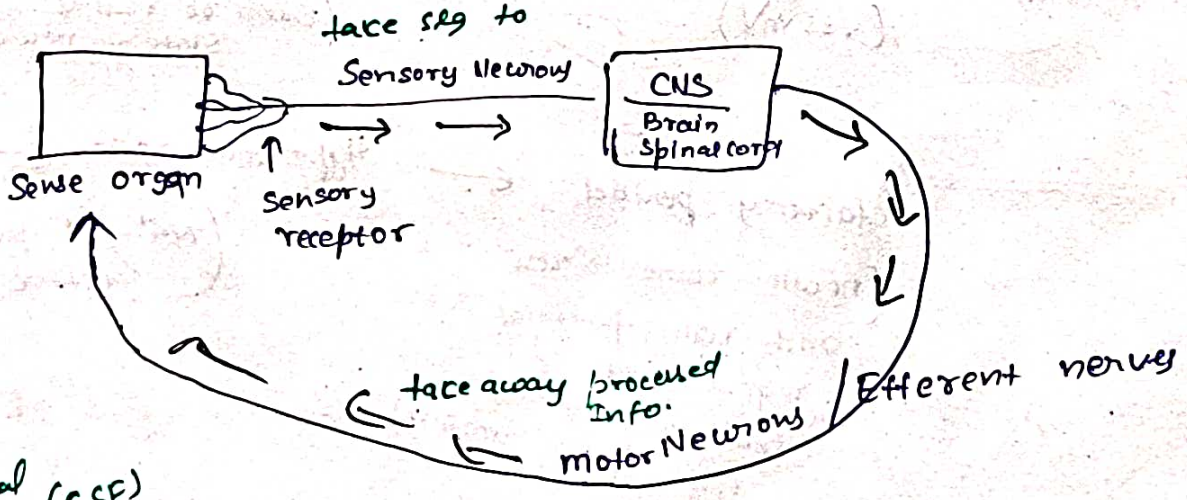
Q. Diff b/w Motor and Sensory.

Somatic Nervous system
- Sensory Neurons
- Motor Neurons

Automatic Nervous System

Q. What are sensory and motor Neurons.

Sensory Neurons / Sensory nerve fibre / afferent nerves



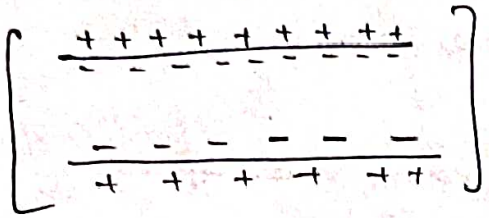
Cerebrospinal fluid (CSF)

Neurons :- functional unit of nervous system.

Slides — functions of all parts.

Imp. one Q.

Nerve Impulse Transmission



Resting state

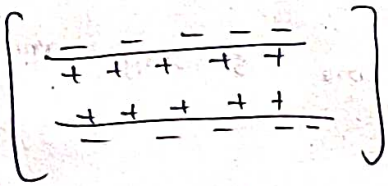
unequal charge distribution

Polarized state of membrane

Resting potential (RMP)

−70 mV to −90 mV.

Resting potential —(threshold level / Crosses - start of depolarization of membrane)→ Depolarization (Na^+ open, K^+ closed)



Depolarized state

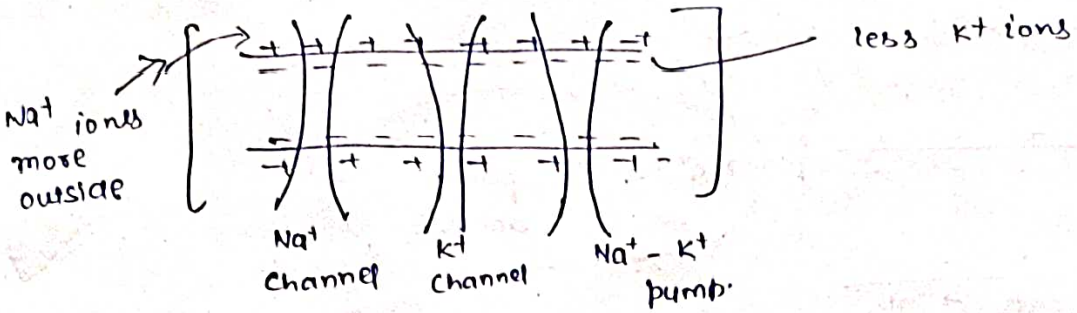
Peak of depolarization → Action potential (+35 mV) → Repolarization (opening K^+, closing Na^+)

(Start of resting state of neuron)

Hyperpolarization (Na^+-K^+ pump active)

Refractory period

(neuron comes to rest and resting potential regenerated. Ready to receive next nerve impulse)

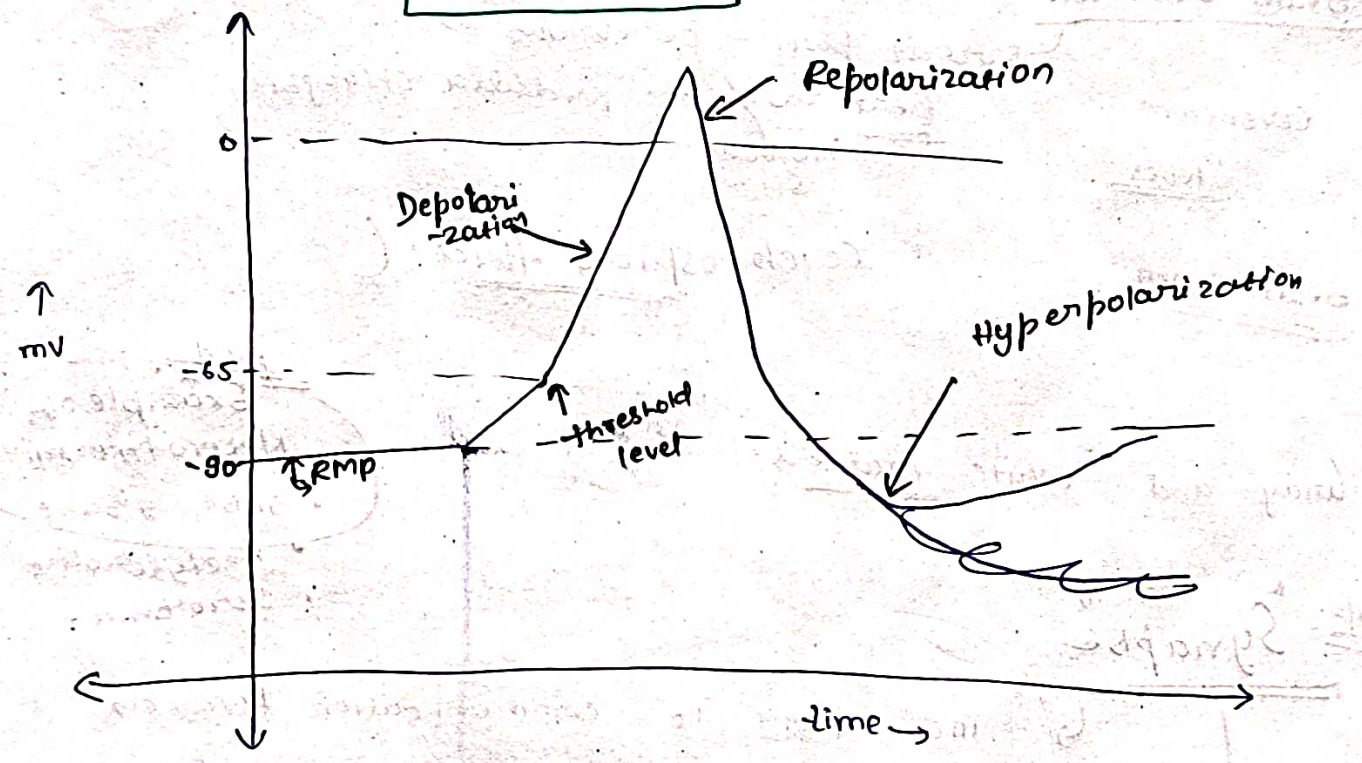


Start of depolarization ⟶ Na+ channel opens.
K+ channel closed
Na+- K+ pump closed.

At Resting potential ⟶ All Na+, K+ and Na+- K+ pump closed.

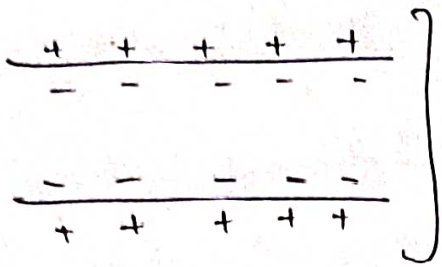
Repolarization ⟶ closure of Na+
opening of K+

Action Potential



In exchange of 3Na+, 2K+ comes inside.

After hyperpolarizion



$Na^+ - K^+$ pump active

3 Na^+ ouside
2 K^+ inside.

Imp: Slides

Saltatory Conduction

↳ Action potentials appears to jump from node to node on myelinated axons.

Brain structure

↳ largest part - cerebrum
heat rate/ nervous st - medulla oblongata.

Cerebram
↳ lobes.

Cerebrospinal fluid.

Brain stem

Gray and white matters.

Example of Neurotransmitters
- GABA, glycine
- Acetylcholine
- serotonin.

Imp: **Synapse**

↳ the point of communication between two neurons.

- Electrical
  ↓
  direct connection.
- Chemical.
  ↳ Cat ions and neurotransmitters.

Imp: Example of neurotransmitters

- Acetylcholine
  GABA and glycine
  Serotinin.

Pulmonary and systemic

oxygen dissociation curve

Affect O_2 & CO_2 in dissociation curve Bohr effect.

Chloride Swift.

Diff motor & sensory neuron

Myelinated and unmyelinated

12 Cranial Nerves

↓ not imp. all named

Spinal Nerves

31 - pairs

1. 8 pair cervical spinal nerves
2. 12 pair thoracic spinal nerves
   5 pair lumbar " "
   5 " sacral " "
   1 " coccyx " "

Types of neurons → Bipolar, Unipolar. } depending on structure.
↓ Multipolar

30 oct

Immune System

- Defense
- Auto tolerance — recognition of self - non-self
  - tolerance against self.
    - ↳ generate auto immunity (against failure of autotolerance)
      - ↳ auto immune disorder.
- Immune Surveillance
  - ↳ Surveillance against malignant and cancerous.

Immunity

- Innate
  - By birth immune System → germline
  - Physical / biochemical barries
    - Skin, mucus, Nasal hairs.
    - gastric, saliva, pH.
- Adoptance
  - depends on lots of signaling.
  - Humoral Immunity → B cells and Antibodies
  - Cell-mediated → T-cells
    - T-helper
    - T-cytotox

T-cells

- T-helper → activate B-cells → produce antibodies.
- T-cytotoxic → find infected cell and kill it.

need support of Humoral.

Immune Cells

1) WBCs
   - Neutrophils
   - Basophils
   - Eosinophils
2) Lymphocytes.
   - B cells
   - T cells — T-helper (T_H)
     — T-cytotoxic (T_C)

Antigen presenting cells.

(3)
- Macrophages
- Dentritic cells
- Mast cells

Imp

Antigen presenting cells.

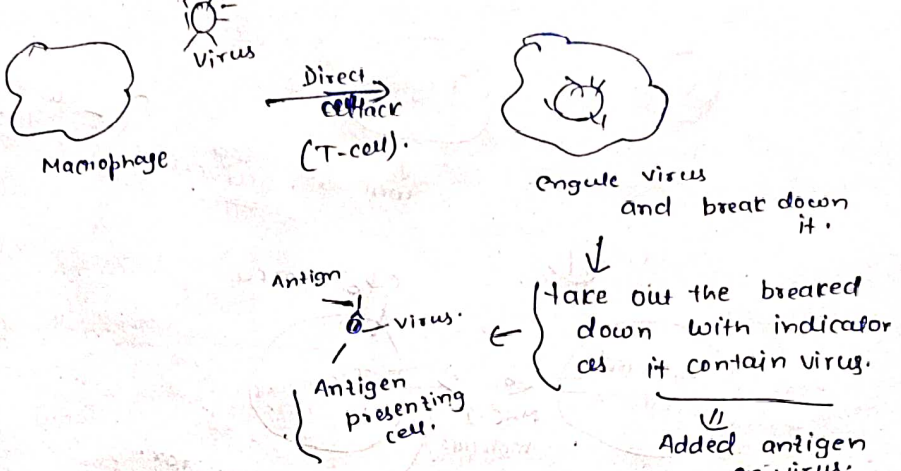
Macrophage, Neutrophils and Dendritic cells

Imp:

Phagocytosis → like → food

Attact virus as take inside it.

Amoeba taking food } engule food.



Ques

Q what is Antigen presenting cells ?

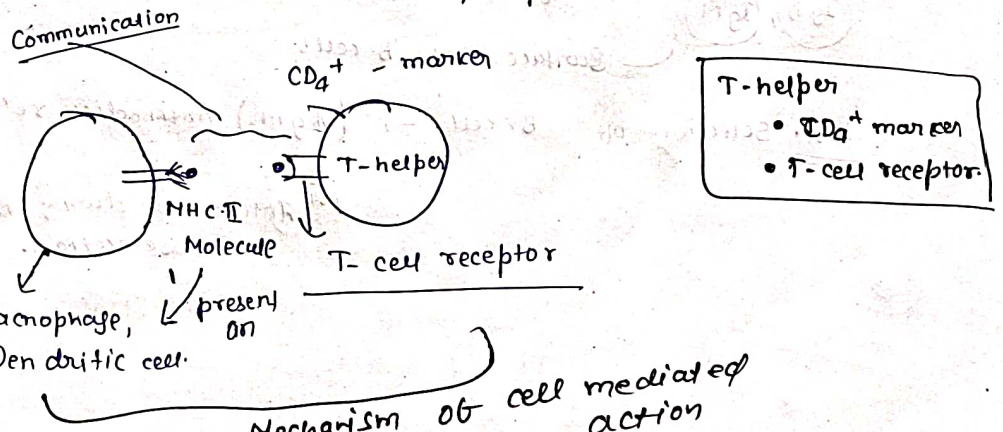
those cells which phagocytose the virus and degrade it and present on the surface through MHC-II molecule.

Major histocompactibility complex.

Example

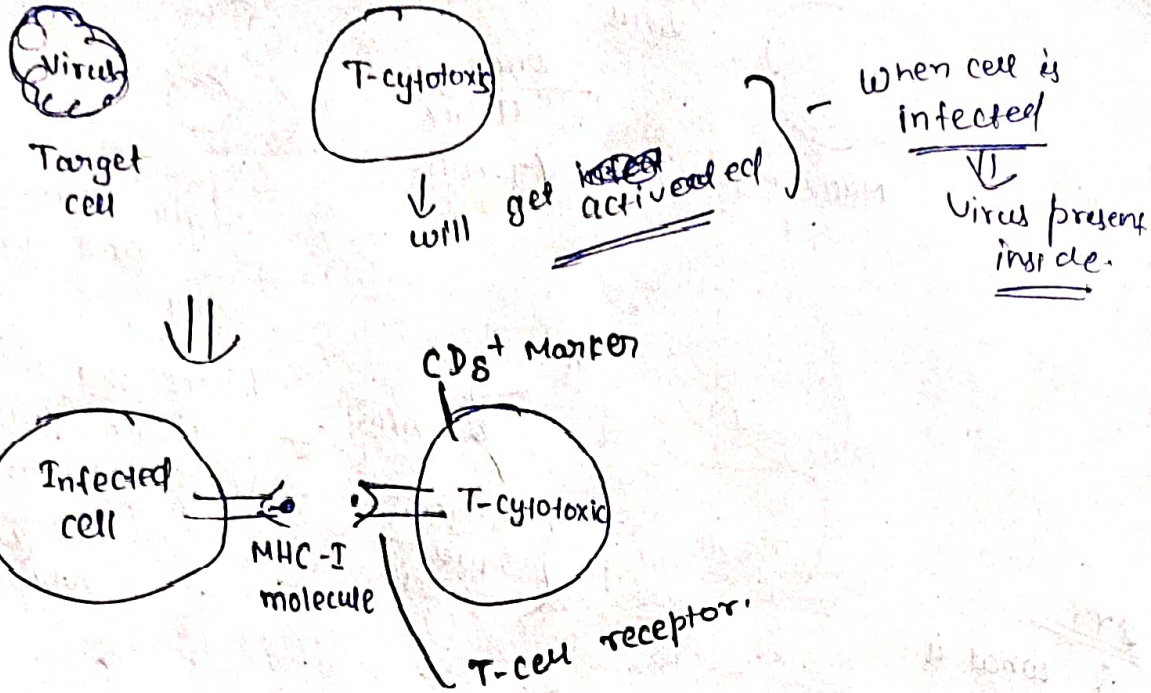
Q. what is APC and its types ?

↳ keyword :- phagocytosis & present them on the surface.



T-helper
- CD_4^+ marker
- T-cell receptor.

Mechanism of cell mediated action.



Question

One-word

Anti-bodies
- Ig A - tears, Saliva, mucosal secreation
- Ig E - allergic reaction; parasitic Infection → Ig E → mast cells → they release histamines
- Ig G → placental transfer → foetus → mother to foetus.
- Ig D, Ig M → Surface of B-cells.

first · Selection of B-cell → (Ig M) Antibodies released

1st Antibodies during B-cell Selection.

Gene Expression regulation — 3 type question.

(1) Immunity by birth — Innate
+ for life — Adaption.

Gene Expression → pathway (Particular gene act on the part of body)
⇓
gene expression regulation.

From DNA to mRNA to protein
Flow of Information (Central Dogma)

DNA ---→ mRNA ——→ protein.
(Transcription) (Translation)

Slide ⇓ first class

① DNA level Chromatin Regulation

Transcriptional Regulation

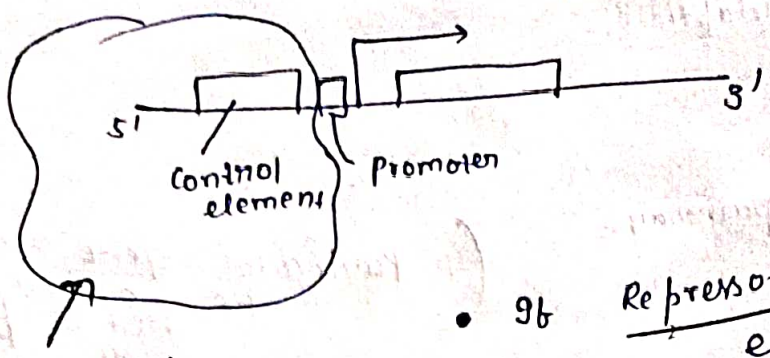
DNA wrapped around Histone. } gene wrapped around Histone

If Histones is methylation
⇓
gene will not be accessable
⇓
gene silenced.

Acetylation — open form → gene will undergo expression

Acetylation of Histones → gene
⇓
to start transcription process.

Transcriptional Regulation



Activators & Repressors

- If Repressors are bound to control element

⇓

no transcription or limited

- If Activators are bound to control element

⇓

transcription phase

- Amount & time also depend on Activators & Repressors (mRNA).

(3) mRNA ⟷ protein (Translation)

(4) Translational Regulation

(5) Post Translational Regulation

Post-transcriptional regulation

- 5'-capping
- Polyadenylation
- RNA Splicing.

maintain transport (4)

mRNA life span is short.

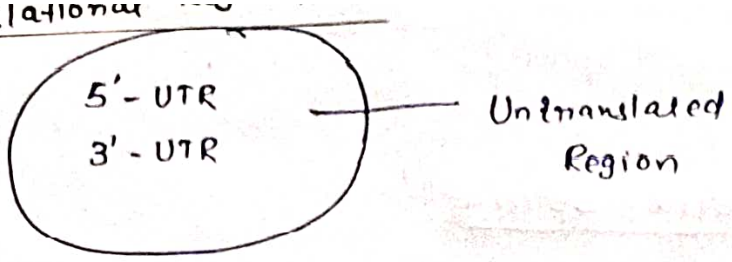
(2) Stability of mRNA

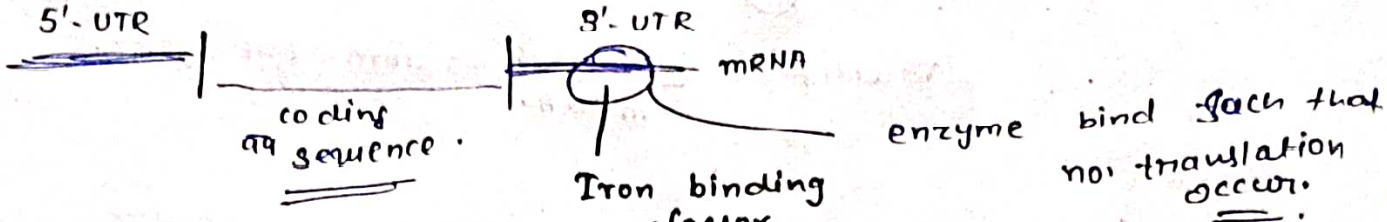
(6) longitivity

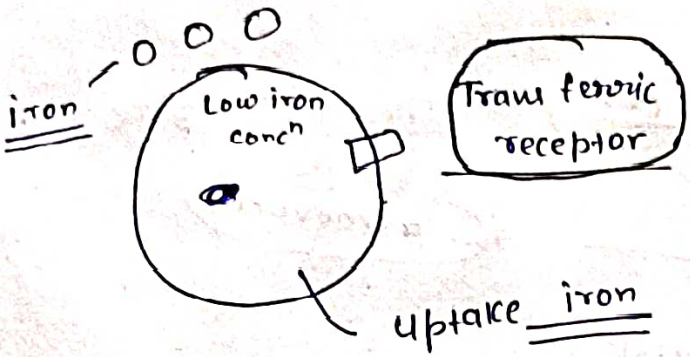
- Casein gene expression in milk (1-2 hr) mRNA.

Hormone (prolactin) ⟶ Casein gene expression stability increases to 24 hr.

Translational



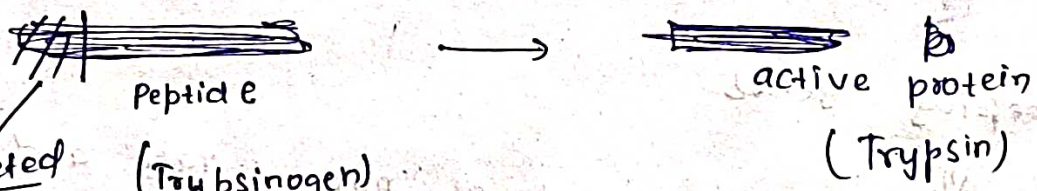




Post-Translational Regulation

- chemical modification of protein
  e.g. Methylation and Acetylation.

- Trypsinogen → activated → Trypsin.
  ↳ Inactive



Splicing

→ ~ 25000 genes

→ 1 gene → ~~making~~ one protein } X — not applied here

~ 1 lakh protein expressed in a cell.

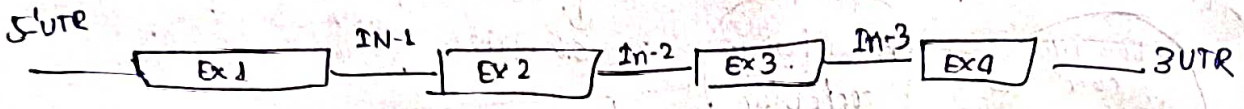
- diversity arised in splicing.

⇓

Alternative Splicing

⇓

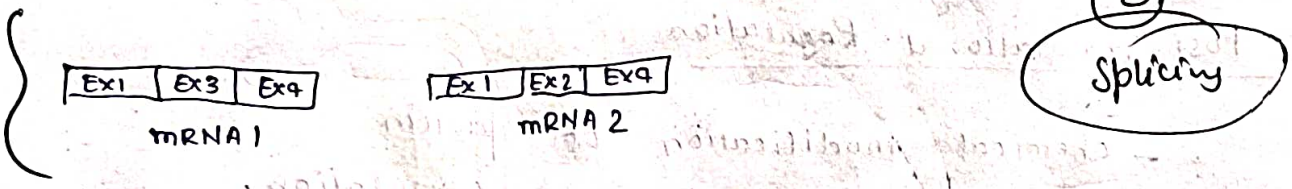
multiple transcipts from one gene.
mRNA.



normal Splicing — Ex1 Ex2 Ex3 Ex4 — In- removed

↓

translation process.



Alternative Splicing — multiple transcript possible.

↓

way of formation of multiple transcript from one gene.

Third genes Housekeeping genes

⇓

These genes expressed as normal rate and all the time to maintain Basal level of proteins.

Regulated genes

↳ under regulation

02/11/23 notes

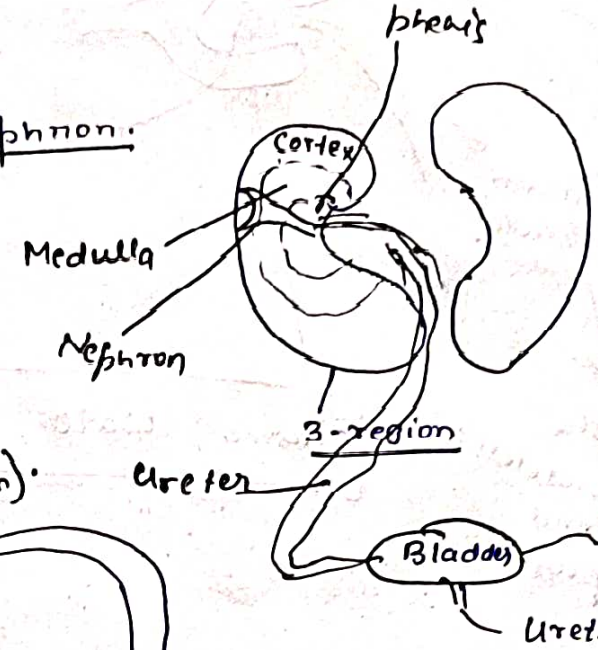
Excretory System

30

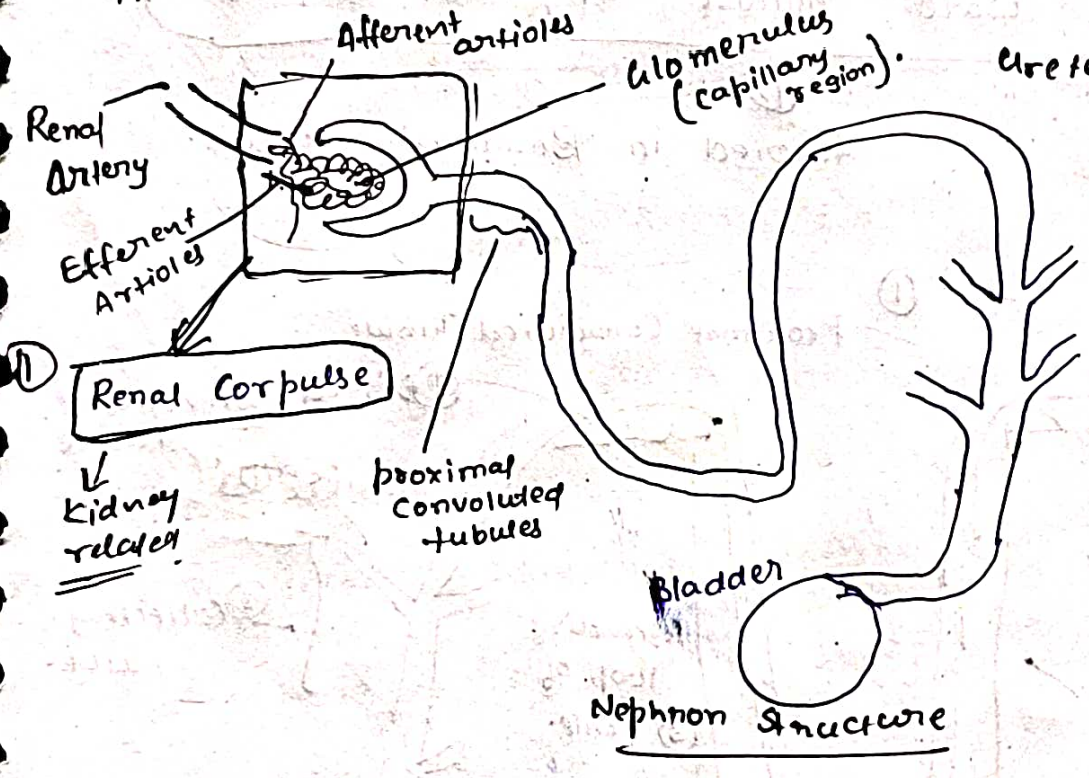
→ Kidney

↳ formation of urine

Functional Unit is Nephron.



Approx - 1 M Nephron present

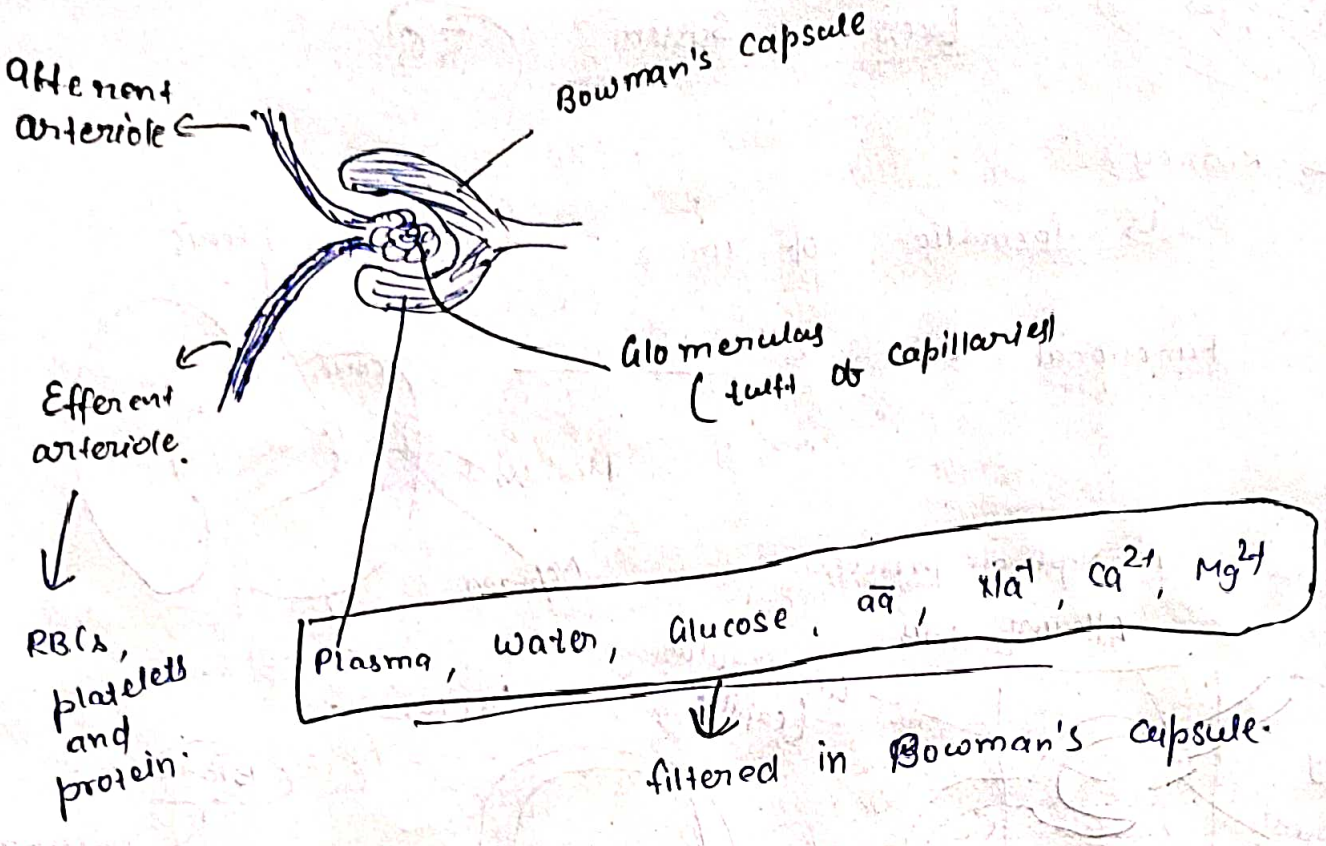


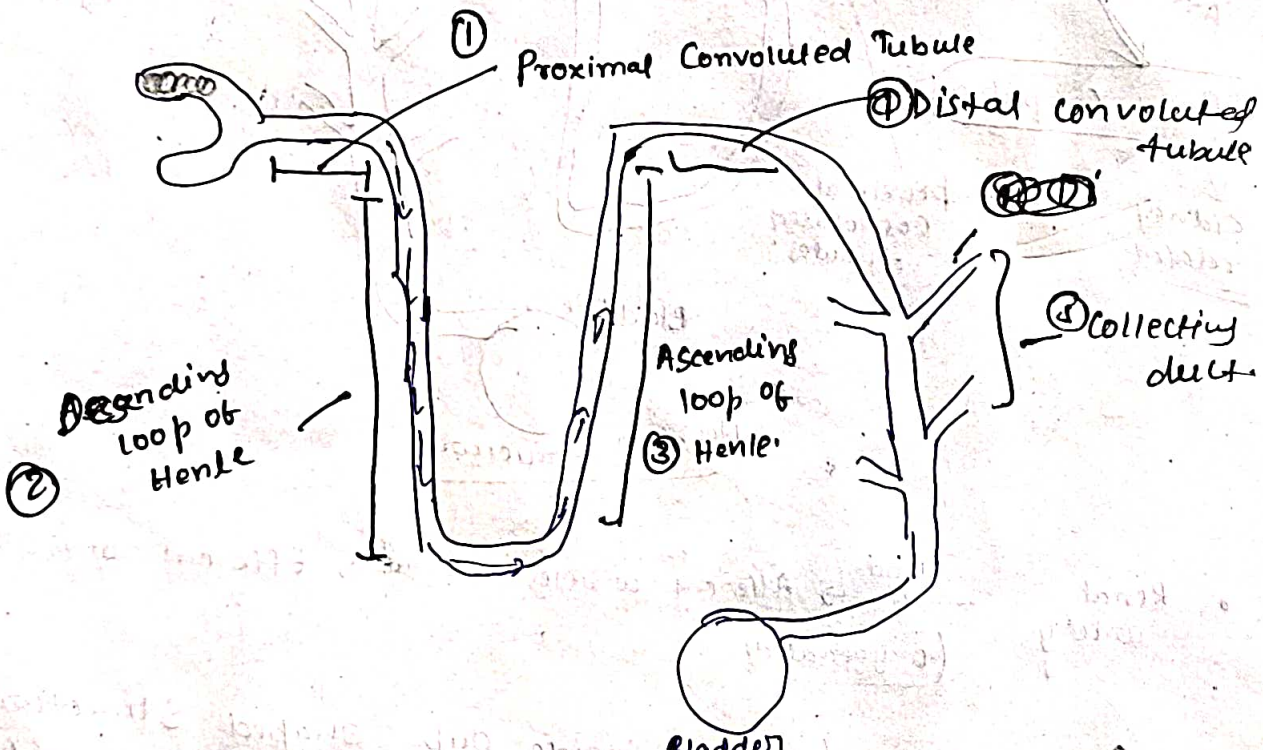
Nephron Structure

- Renal artery → (Blood in) Afferent artioles (oxygenated) → (Blood out) Efferent artioles
- Glomerulus (present inside cup shaped structure)
  - ↓ left of capillaries.
  - ↓ Bowman's capsule.

(1) Q. Exam

Renal corpulse → Glomerus
→ Bowman capusule.





Exam

Q. Path of the filtered flow in renal tubules

Fil

① Proximal Convoluted Tubules (PCT)

↓

Henle loop (Descending and Ascending

↓

Distal Convoluted tubles

↓

collecting duct.

Exam

Path of Blood flow

Renal artery

↓

Afferent arteriole (taking in blood)

↓

Glomerules.

↓

Efferent arteriole. (taking out blood)

Exam

Q. What are three processes/events that going ingide the nephron?

(1) Glomerular Filteration — process by which (plasma, - - -) fitered by Bowman's cap (65-80%) water filtere - filterated.

(2) Tubular selective Reabsorption } maintain ionic equilibo

(3) Tubular selective Secretion }

Driving force of filteration

- Hydrostatic pressure (In glomerulus) — Blood pressure — 55 mm
- Osmotic pressure & colloidal pressure (due to plasma). (Bowman's capsule) 15mm.

30%

↓

due to plasma

driving force of filteration = Blood 55mm - (30+15)

= 10 mm Hg.

↓

This pressure drive filteration.

125 ml per min

Reabsorption

— H_2O is absorbed in Descending loop by Osmosis
glucose absorbed.

— Na^+ is absorbed in Ascending loop (No water absorbed in this loop.

Secreation — K^+, H^+, Secreted.

Exam:

Q. ~~what are three event goes on~~ Nephron? (water)

Collecting duct.

Hormonal Regulation

① Renin — Angiotensin — Aldosterone pathway

② Anti diuretic hormone / Vasopressin.

Important