27/01/20 -

Proteins :-

In our body after water, proteins are the next most important molecules.

→ Amino Acids $-NH_2$, $-COOH$
→ contain nitrogen

* All proteins have unique 3D shape.

→ Antibody
→ Enzymes — Chemical reaction
→ messenger — grown hormone
→ structural components — (Actin)
→ Transport / storage
(haemoglobin) O_2 carries — (ferritin)
↓
Binds & carry atoms & smaller molecules.

① Contractile Proteins :-
(Muscles)
made up of protein.

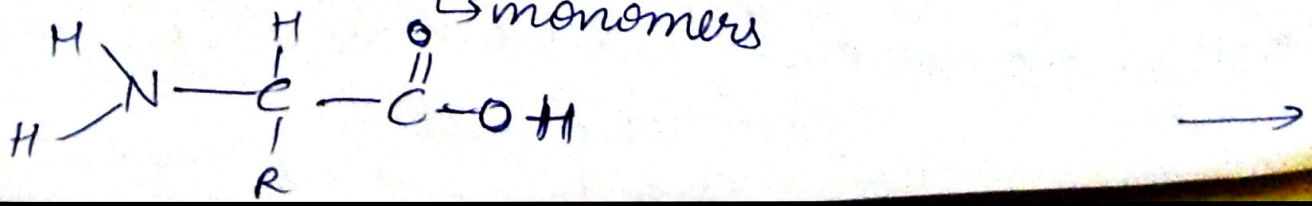
② Digestive proteins :- (Enzymes released).

③ Transport proteins :- (Haemoglobin)

④ Structural proteins

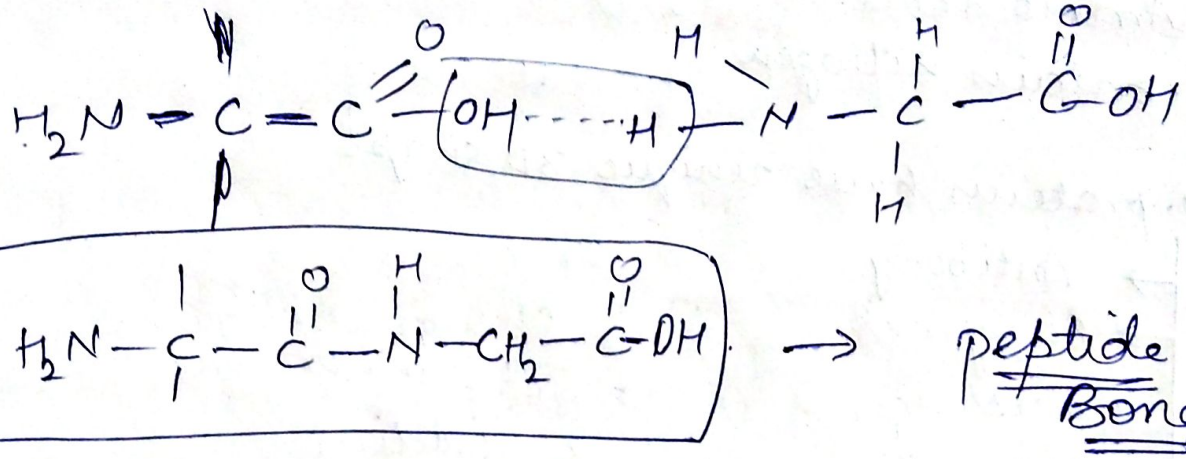
⑤ Storage proteins (Myoglobin)

Structure (Amino Acids) :-
↳ monomers



→ R-H → glycine
→ Hydrocarbon
→ Acid/Base

joining of Amino Acids



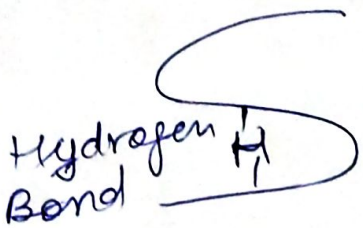
→ peptide Bond

Structure O—O—O

* Sequence of Amino Acids ① primary structure

Normal RBC → sickled cell

② secondary structure



Alpha Helix

β pleated sheet

butanes me (sketch)

③ Tertiary structure :-

Proteins → That are hydrophobic move away from water — Hydrophobic forces.
Also, their Ionic forces (i) (ii) (iii)

→ fibrous.

Quaternary structure :-

Two or more parallel chains linked with hydrogen bond. — polypeptide Bond

Example:- Haemoglobin

⇒ Denaturation of proteins:-

(1) Disruption of tertiary & quaternary structures

(2) Denaturation reactions are not strong to break peptide bonds.

Ex:- Boiled Egg so, primary structure (sequence of amino acids) remain same.

⇒ Nutrition Out of 22, 13 amino acids can be produced in body.

amino acids → Essential Amino Acid. (Micele).

⇒ Digestion - digested in stomach

Protease (Enzyme) is released & digest proteins.

Gacidic → Excess protein is either turn into fat or thrown out of body.

⇒ Haemoglobin & Myoglobin were the first structures to get figured out.

⇒ DNA has the structure & code.

↓

sent to RNA

↓

comes out & form genes

↓ (Sequence of DNA).

↓

Have info of protein.

Structure of Protein

Proteins are made up of peptide bonds.

Primary structure :- The linear sequence of amino acids within a protein.

* drives the folding & intramolecular Bonding

⇓

Secondary structure :- The Hydrogen Bonding b/w amino groups & carboxyl groups in neighbouring regions of protein chain causing certain patterns to occur.

Alpha Helix β pleated sheets.

Tertiary structure :- The Ensemble of formations & folds in a single linear chain of amino acids (polypeptide)

Quaternary structure :- Macromolecules with multiple polypeptide chain or subunits.

Primary → carbon (alpha carbon) bonded to — H atom
— COOH
— NH_2
— R.

Secondary → H bonding b/w polypeptide units.

Tertiary → Comprehensive 3D structure.

Moves Inward ← Hydrophobic "R" ↑ avoids water.

Moves Outward ← Hydrophilic "R" → seek aqueous contact

Ionic Bonding → +ve & -ve charged 'R' come in contact.

Disulphide bridge → "Vanderwaal forces" (polarised molecule interaction)

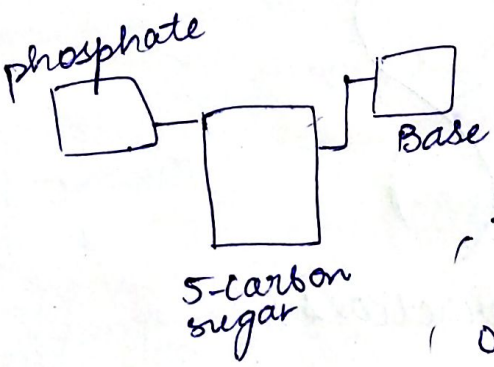
29/01/2020

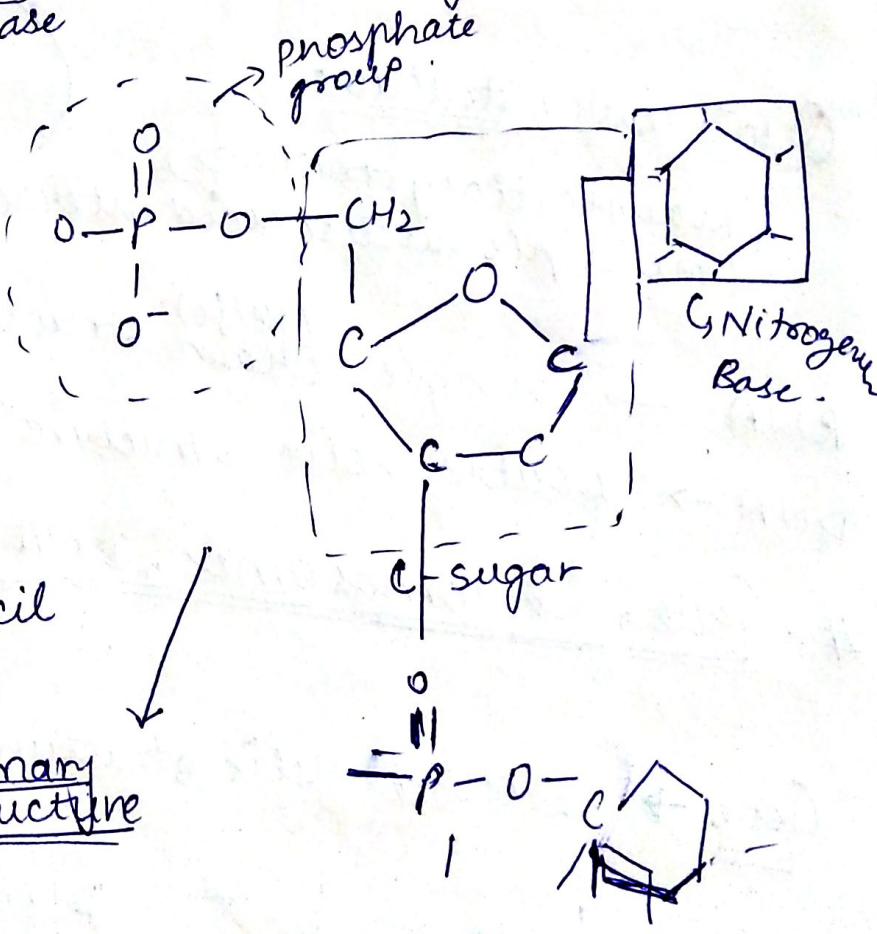
#Nucleic Acids :-

- what are Nucleic Acid
- Types of Nucleic Acid → DNA, RNA → TRNA, MRNA, RRNA
- structure of NA
- Difference blw gene, chromosome, DNA
- Protein synthesis
- Mendel's Law

Nucleic Acid → found in nucleus of cell

↳ composed of nucleotides, which are monomers made of three components → 5-carbon sugar, phosphate group, Nitrogeneous base



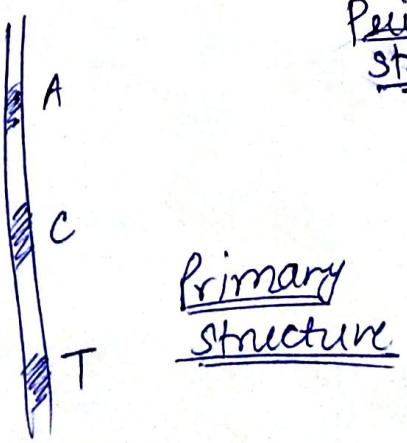


Base → Adenine, Guanine, Cytosine, Thymine / uracil

Thymine → in DNA

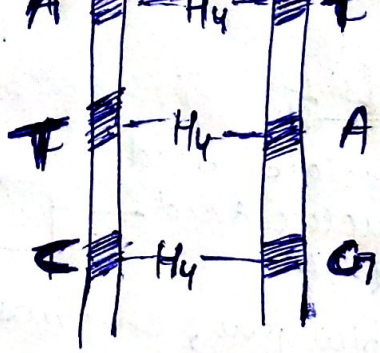
uracil → in RNA

Primary structure



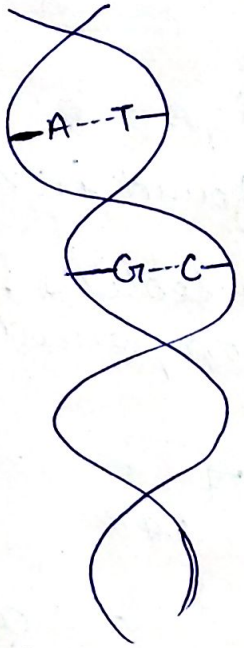
Primary structure

A - T
C - G



Tertiary structure

((3D) shape)



Quaternary structure

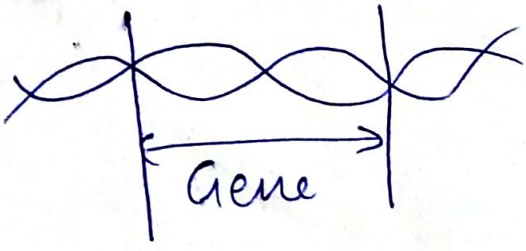
(many tertiary structures)
(multiple nucliec acid interactions)

RNA → single (Helix) chain structure

DNA → Double helix structure

Gene, Chromosomes, DNA :-

Gene → Double Helix structure.



DNA

A particular stretch of DNA is gene.

Chromosomes :-

Chromatin - long thread like structure

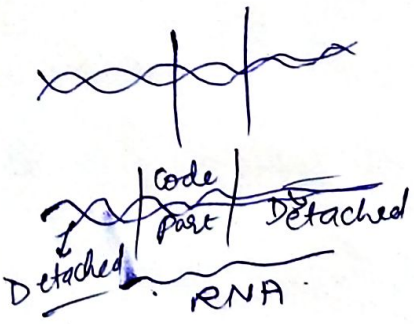
chromatids - chromosome that is newly copied of chromosome by a single centromere

→ Chromosome decides the sex, character, shape, etc. of people.

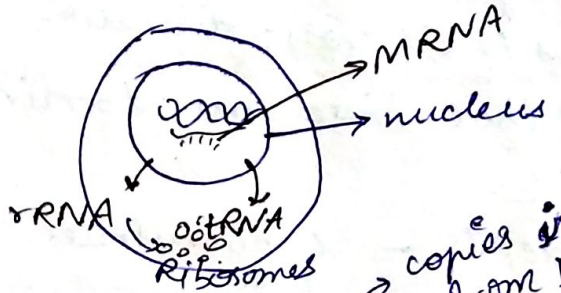
→ composed of DNA molecule.

Sex chromosome → XX (women) XY (Men)

Protein Synthesis :-



[Ribo-nucleic acid]



copies info of codones from DNA gene in terms of 3 nucleotides

MRNA (Messenger Ribo Nucleic acid)

rRNA → provide material (Ribosome) to form protein

tRNA → collect material & help in formation of protein.

① Transcription :- first step of process of changing DNA into RNA by (RNA polymerase) → enzyme.

The
- Initiation
- elongation
- Termination .

② Translation
- Initiation
- elongation
- Termination .

→ process by which mRNA is decoded & translated to produce polypeptide.

03/02/2020

Mendel's Law :-

Mendel is known as father of genetics.

He experimented on pea plants.

The heritable factors of parents on which child's properties depend. The heritable factors are called genes.

He took two breeding plants. He fertilised stemen of one plant with (one colour) egg of another plant (other colour) called Cross-fertilisation. After the first fertilisation, he found all are green. Second time, 3:1 ratio for green & yellow when he did cross fertilisation again.

He concluded that there are dominant genes & rare genes.

Balanced fat :-

1) Macronutrients - carbohydrates
   Fats
   Protein
2)
3)
4)
5) Sugar with salts to be ionized.

Thermic Effect of food :-

Body Mass Index (BMI) :-

Healthy eating pyramids

Vitamins :=

→ organic substances required in less quantities.

→ Two types of vitamins → water soluble
→ fat soluble

→ Deficiency of vitamins causes certain diseases.

↳ Vitamins → A → cell & tissue growth.
→ B →
→ C → Antioxidants
→ D → responsible for hormones
→ E → Antioxidants.

→ Antioxidants :- they lose outer e^- from orbit & get oxidised.

The free radicles are always ready to react & dont allow other atoms to react. so, they are antioxidants.

Imp
GI Index :-

Ketogenic Diet :- Different types of diet.

↳ Very low carb & high fat diet.

reduce carbohydrate intake & replace it with fat. This reduction in carbs put your body into metabolic state called Ketosis.

04/02/2020 . DNA Technology

1) DNA fingerprinting
2) RDT & cloning. (Campbell)
3) Applications — (a) Transogenic Microbes
(b) genetic v. modified foods
(c) genetic v. modified animals.

DNA Fingerprinting :-

Nar borough.

Colinpitchfork.

Imp. Difference b/w RDT & cloning ?

RDT (Recombinant DNA Technology).

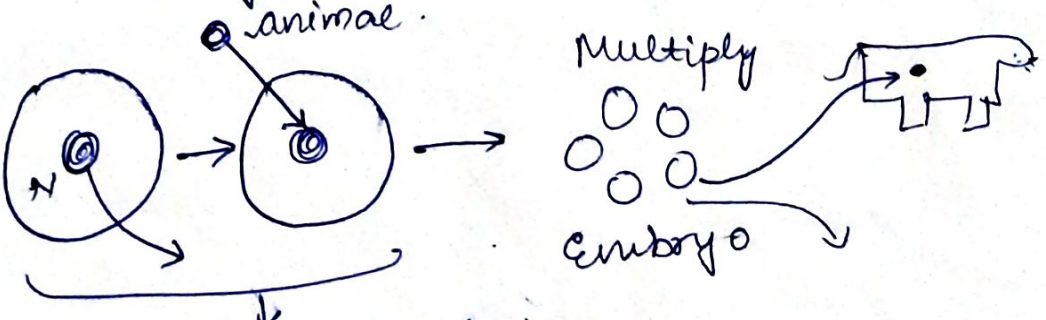
It is set of laboratory techniques for combining genes of different DNA of different species into a single DNA Molecule.

Cloning :- Exact copy of individual.

↳ process of producing genetically identical individuals of an organism either naturally or artificially.

HS12 (Nitrobenzene).

How cloning is done ?



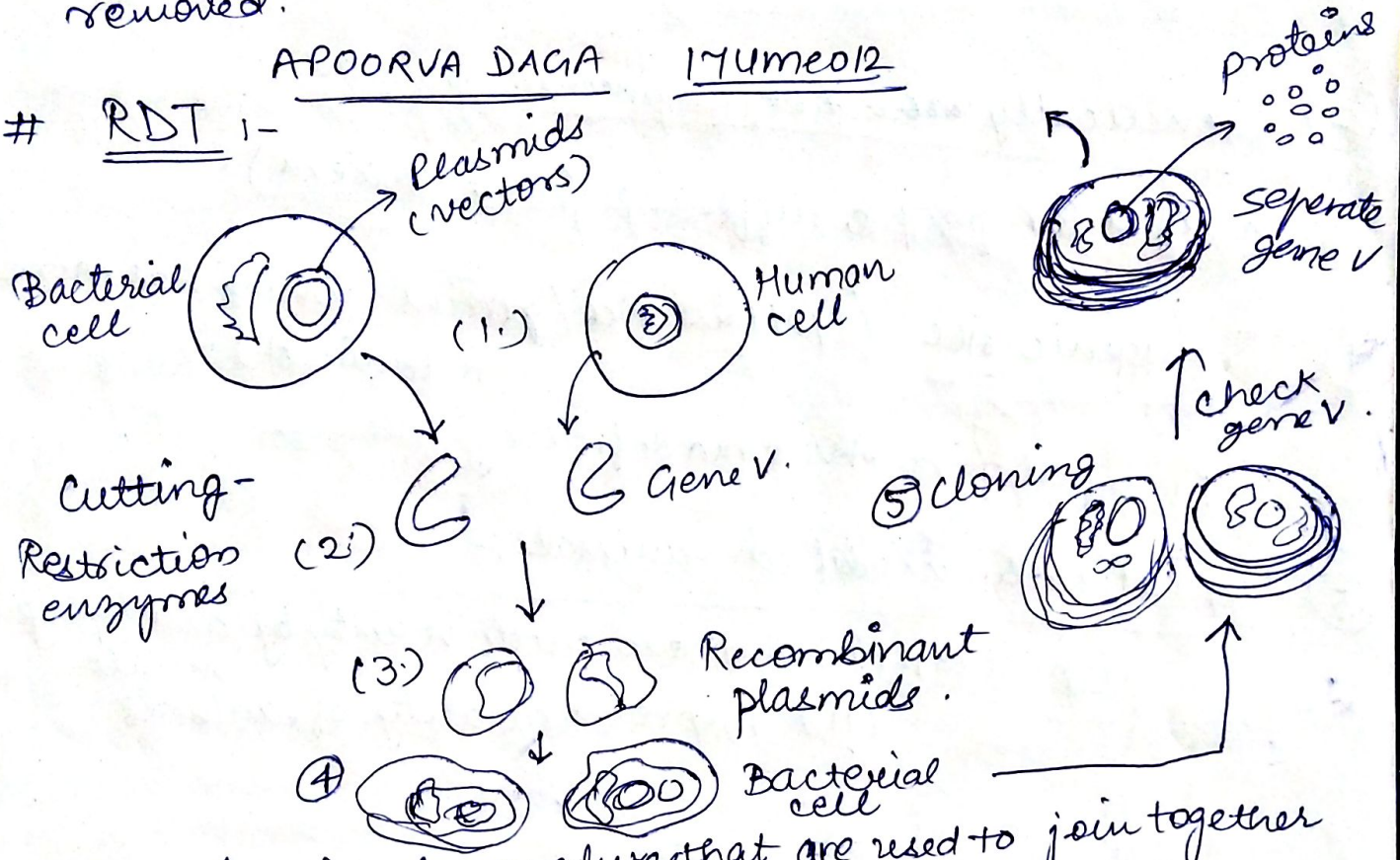
Nucleus Transplantation

Stem cells can also

cloning works by taking a genetic [illegible] organism & recreating it in another place using process known as somatic cell nucleus transfer (SCNT) which takes a somatic cell like skin cell & transfers its DNA to an egg cell with its nucleus removed.

APOORVA DAGA 17UME012

RDT :-



RDT → A series of procedures that are used to join together (recombine) DNA segments.

Under certain conditions, Recombinant DNA Molecule ~~(constructed from segments~~ can enter a cell & replicate there, either on its own or after it has been integrated into chromosome..

⇒ Applications :-

(1) Transgenic Microbes :- (i.) Humulin.
↳ first artificial insulin produced by transgenic microbes.

(2) Hepatitis-B ↑
(iv.) Vaccines

(ii.) EPO.

(iii.) Human growth hormone.

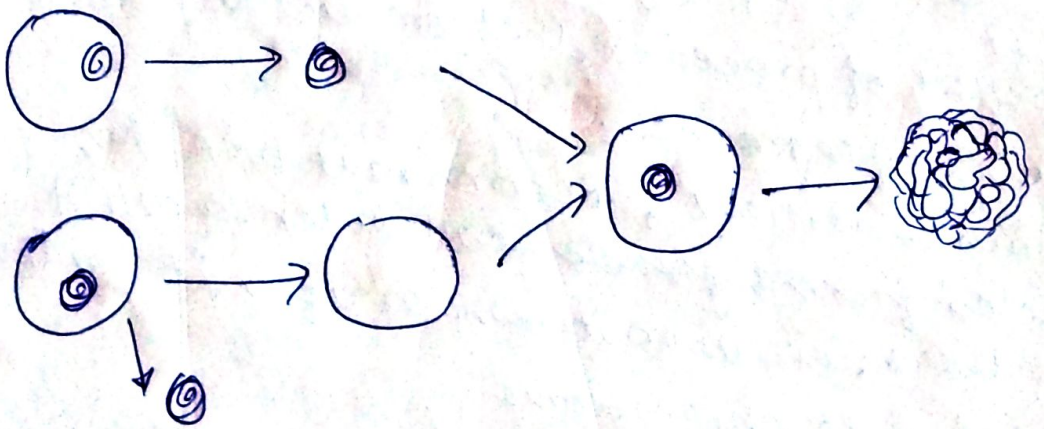
② Genetically modified foods (GM foods)

Qualities :- i) Pest resistant
ii) Tolerate harsh water.
iii) Increase the nutrient content.
iv) Increase the shelf life.

③ Genetically ~~modified~~ engineered potatoes :-
(useful for people suffering from cholera).

④ Transgenic rice (yellow rice / grains which has more vitamin A).
(useful for A-vitamin deficiency)

⑤ Genetically modified animals :-
properties :- (i.) improve cattle variety by developing muscle
(ii.) improve quality of animals.



05/02/2020

Genome :-
Human Genome project 1990.

Anthrax killer → caused by Bacteria → Bacillus Anthracis.

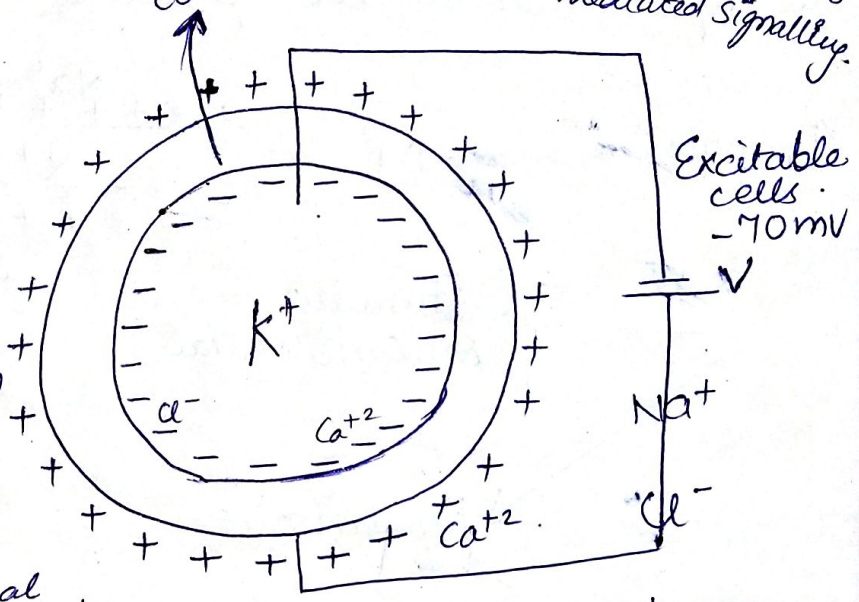
Cheddar Man :-

Human Male fossil found in Gough's cave.
It appears that he died a violent death. Man may had suffering from abone infection due to the large crater like lesion just above skull's right orbit.

Bioelectric Phenomena :- Developmental Bioelectricity refers to regulation of cell, tissue & organ level patterning as result of cell membrane endegenous electrically mediated signalling.

1) Resting Potential
2) Action Potential

Resting potential :-



ECF → Extracellular fluid

The Imbalance of electrical charge that exist b/w interior of electrically excitable neurons & thier surroundings.

Ions :- Na^+, Cl^-.
K^+, Ca^{+2}, Pr^-

Why this Potential?

(i.) semi-permeability.
(ii.) Concentration gradient.
(iii.) Ionic forces / gradient due to Ions.
(iv.) $Na^+ - K^+$ ATpase, Na-K pump. → Imp. process.

→ If Inside of cell becomes more negative (Potential made greater than resting potential) the cell process is called Hyperpolarised.

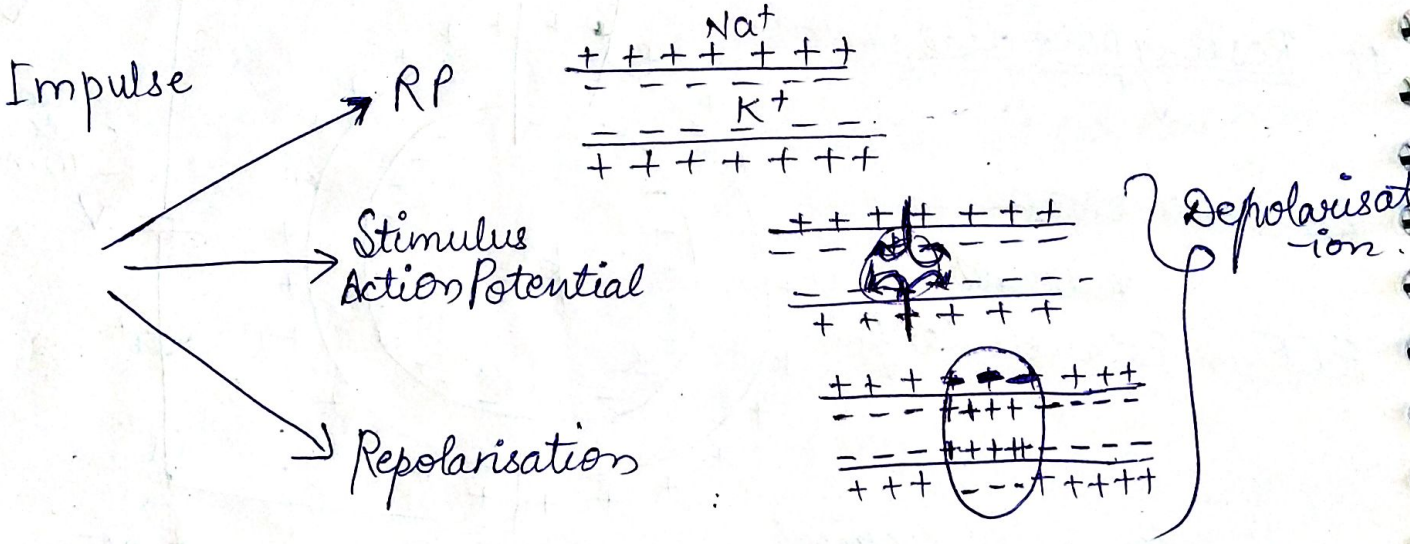
If Inside of cell is less negative (Potential lower than resting potential) then process is called Depolarisation

Action Potential :-

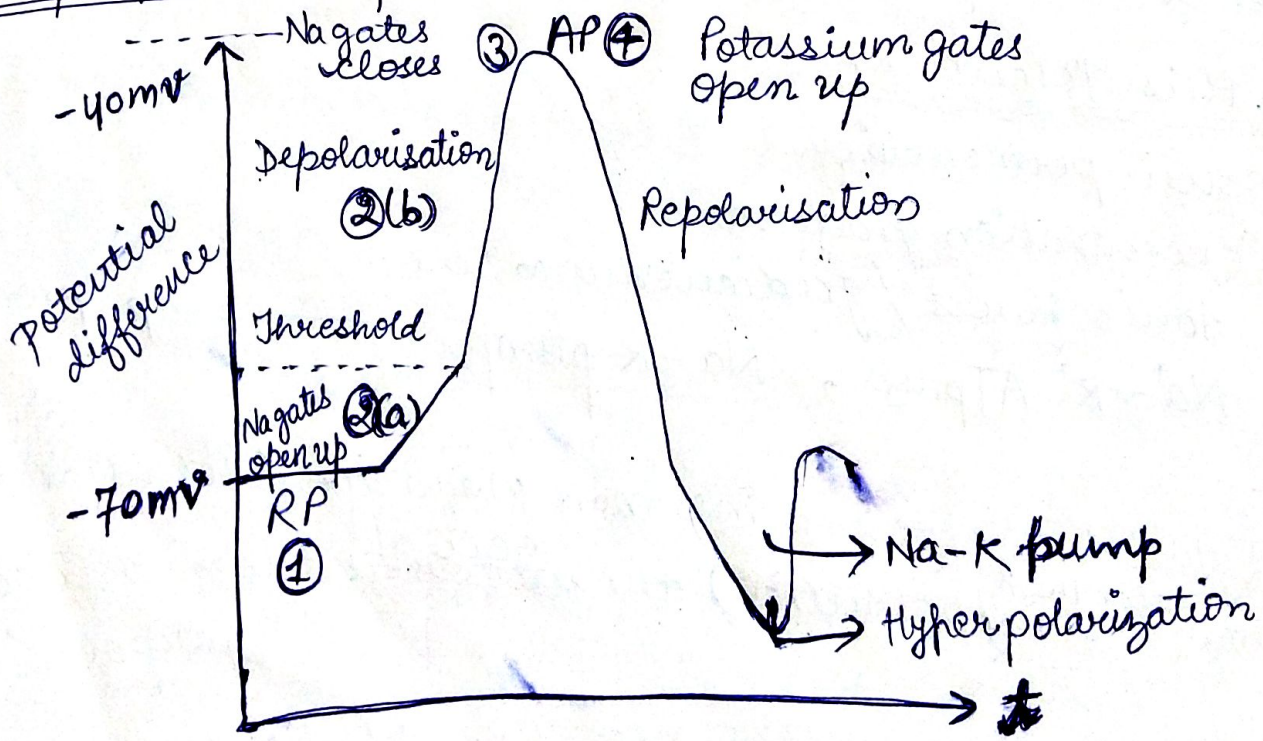
05/02/2020
Apoorva Dafa

An Action potential is part of the process that occurs during firing of a neuron.

During Action potential, part of neural membrane opens to allow positively charged ions inside the cell & negatively charged ions out. This process causes a rapid increase in positive charge of nerve fiber.



Graph for Action potential :=



① All or None Phenomena.

If stimulus is hards, only frequency will change, Action potential will remain same.

10/02/2020

Membrane Transport :-

- Active Transport [Movement of Molecules across membrane from lower conc. region to higher conc. region] (requires cellular energy).
- Passive Transport (without energy input movement of Ions & molecules across cell membranes)
  - Diffusion
  - Osmosis

Nerst Equation :-

$$RMP = \frac{RT}{nF} + \log_e \frac{[K^+]_{ECF}}{[K^+]_{ICF}}$$

$[K^+]_{ECF}$ → K^+ Ions in extracellular fluid

$[K^+]_{ICF}$ → K^+ Ions in Intracellular fluid.

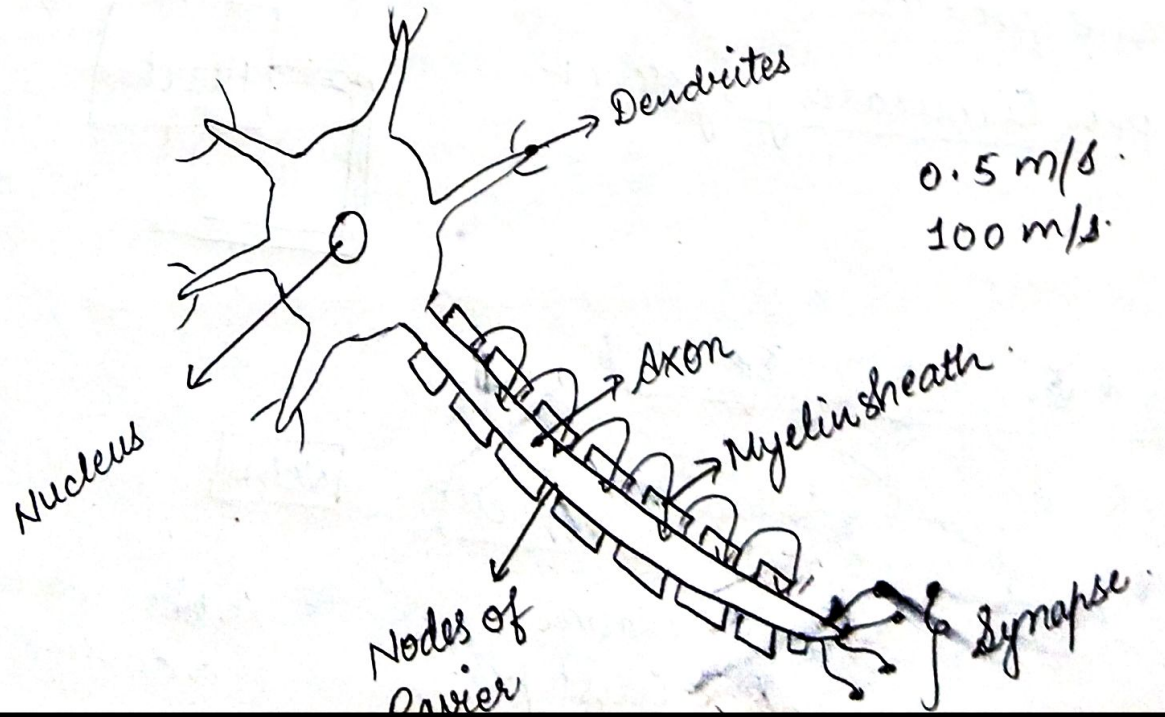
F = 96500C (Faradise No.)

RMP = Resting Membrane potential

Goldman's Equation :-

$$V = \frac{RT}{nF} \ln \left[\frac{P_K[K^+] + P_{Na}[Na^+] + P_{Cl}[Cl^-]}{P_K[K^+] + P_{Na}[Na^+] + P_{Cl}[Cl^-]} \right]$$

Neurons :-



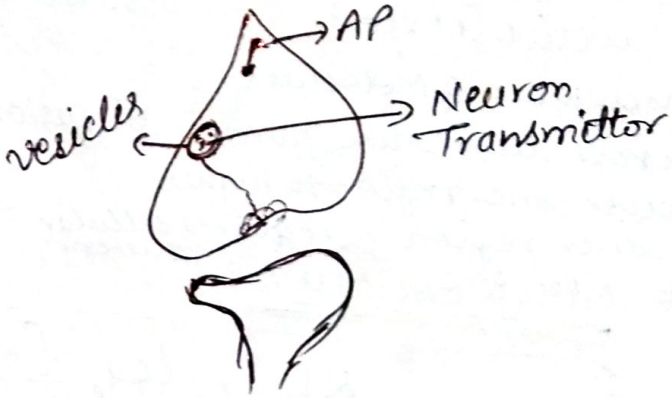
Passing a signal from

Neuron → Receptor

(a) Neuron
(b) Muscle cells receptor

Synapse → 1.) Electrical
2.) Chemical

Chemical Transmission

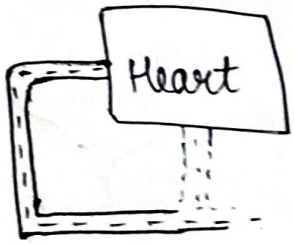


Circulatory System :- → open circulatory system → vessels are not closed.

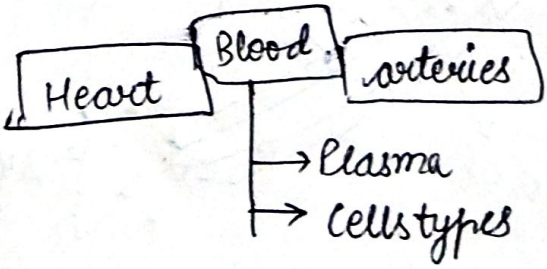
→ Closed circulatory system → Blood leaves & travels in closed circuit.

It is a network consisting of blood, blood vessels & Heart. This network supplies tissues in body with oxygen & other nutrients, transports hormones & removes unnecessary waste products

Open Circulatory system :-



Closed Circulatory system :-

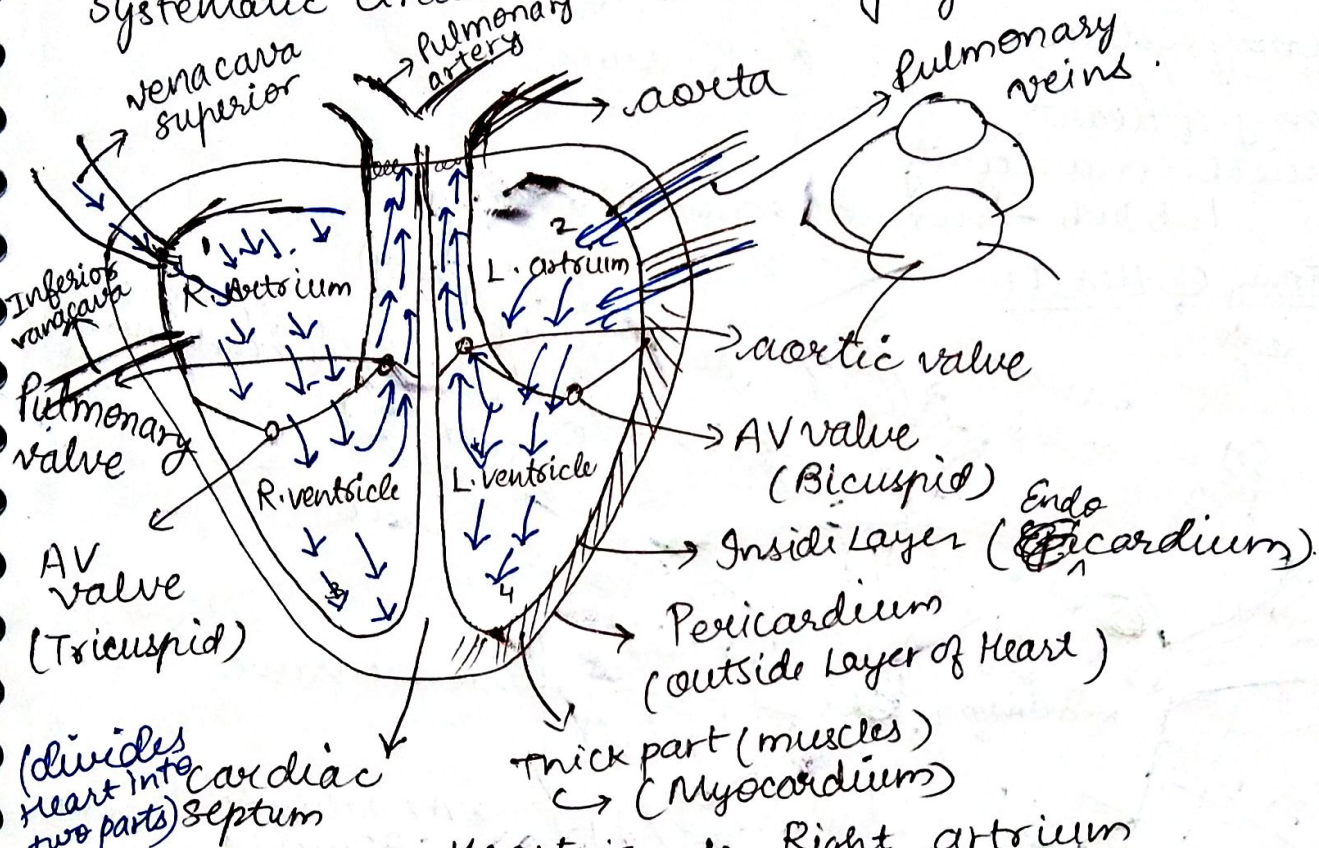


Veins

Arteries when smaller are called Arterioles

Human Heart:-

Pulmonary circuit
Systematic circuit
→ That's why it is called Double circulatory system.



4 Chambers of Heart :-
1. Right atrium
2. left atrium
3. Right ventricle
4. left ventricle.

4 valves —
1. AV valve → (Tricuspid valve).
2. AV valve → (Biscuspid valve) [Mitral valve]
3. Aortic valve
4. Pulmonary valve.

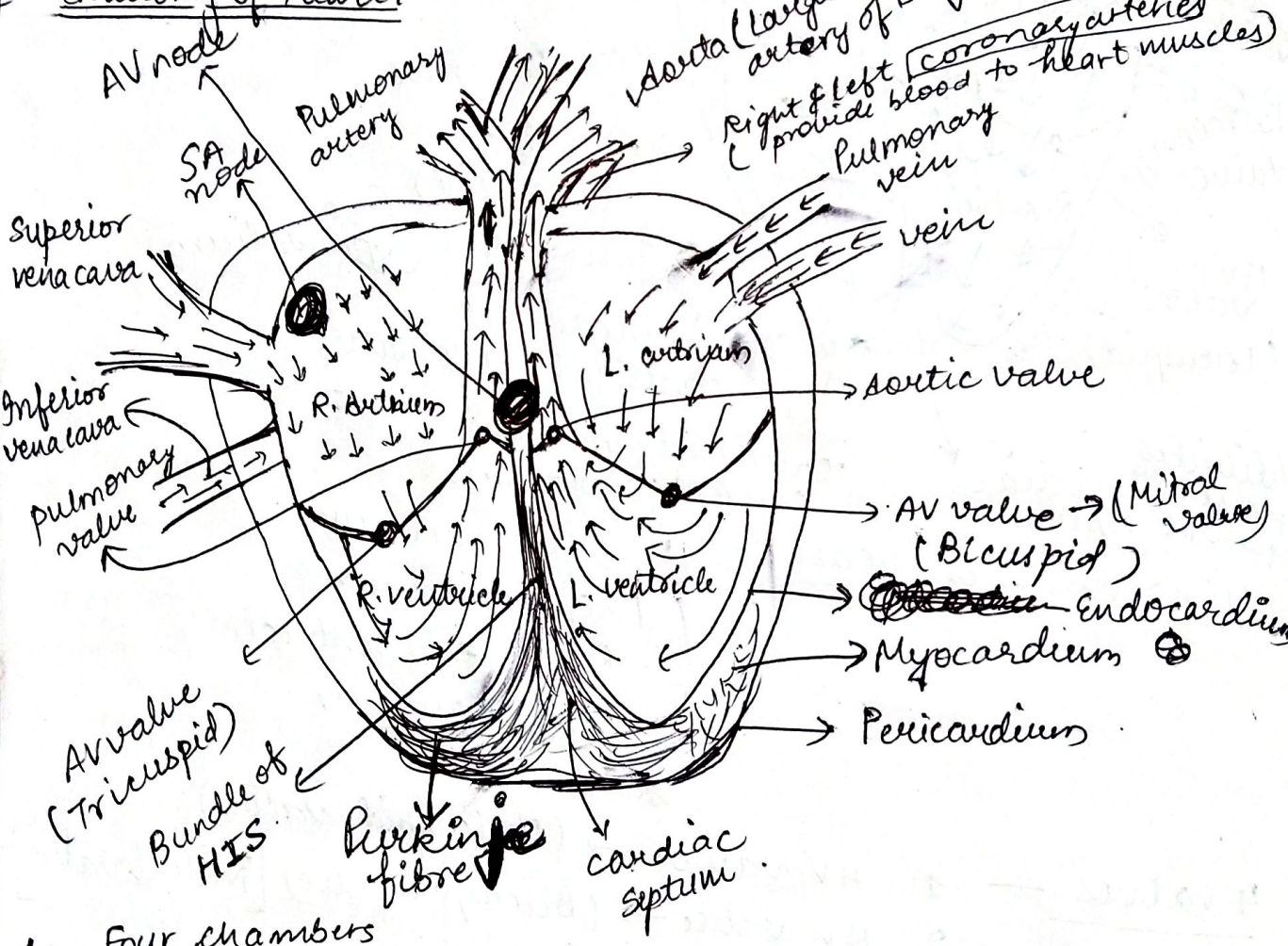
Artries —
1. Superior vena cava → (from top of Body to right artrium)
2. Inferior vena cava → (from Bottom of Body to Right artrium)
3. Pulmonary artery → (Deoxygenated Blood from Heart to lungs)
4. Aorta → (Biggest Artery).
   ↳ (one part
   (other part goes to rest of body)

Imp Q:- Electrical systems or Anatomy of Heart

12/02/2020

* Circulatory system
* Anatomy of Heart
* Electrical conductivity
* Sounds – Lub Dub → normal sound of Heart
* Leakage sound – Hussh – whoosh
* Pressure

Anatomy of Heart :-



1. Four chambers
2. Four valves
3. Arteries & veins
4. Different layers
5. flow of blood.

Coronary arteries → Blood vessels which transport O₂ blood to the substance of Heart.
↳ wrap around entire heart

R. Artrium → Blood from veins & pumps to R.V.

R.V. → from R. Artium & pump it to lungs.

L. Art. → Oxygenated blood from lungs & pumps it to left ventricle

L.V. → pumps O_2 rich blood to rest of body.

Electrical Conductivity:-

Blood pressure in Arteries — 120 mm of Hg (systolic pressure) , 80 mm of Hg (Diastolic pressure)

25/8 mm of Hg → Normal pressure at pulmonary valve.

Electrical conductivity of Heart :=

* SA Node (Sinoatrial node) → also called sinus Node. → Heart's natural pacemaker.
  ↳ consist of cluster cells that are situated in upper part of wall of R. Atrium
  SA node has cells called pacemaker cells.
* Autorythmic → continuously making electrical -
* Activation wavefront → (Action potential (AP))
  ↳ continuously depolarisation & repolarisation in heart originate in specialised cardiac muscle cells called Autorythemic cells.
  Ca^{+2} Ions
  → they are self-excitable
  → able to generate an action potential without external simulation by nerve cells.
* AV Node :- Atrioventricular Node.
  ↳ It is part of electrical conduction system of heart that coordinates the top of heart. It electrically connects atria & ventricles.
* Myocardium Muscles → thick & strong -

① SA Node
② VA Node
③ Bundle of HIS
→ Imp. for electrical activity

ECG 1 - (Imp. for Mech.)

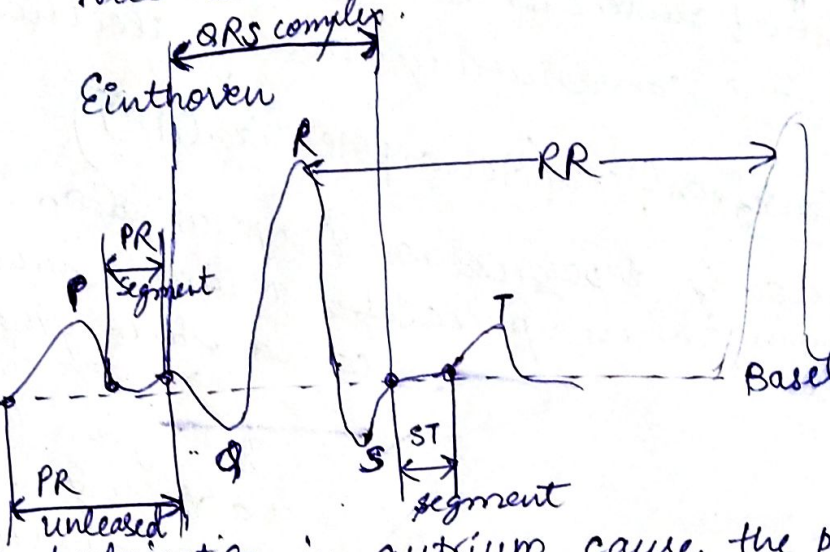
14/02/2020

Electrocardiogram :=

* Intro
* History
* Types
* Difference b/w electrode blood.
* Position of Electrode
* Leads — limbleads
  Augmented.
  Pricordial.

History :-

Einthoven



The wave of depolarisation in autrium cause the peak (P).

T → Repolarisation of ventricle.

QRS is because of ventricular contraction. It is comparitively higher than P because is more strong.

RR should remain constant, If It is not proper or Irregular then this Irregular problem is called Arrythmia

~~Echocardiography~~ : All Informations can not be given by ECG.

Ecocardiography & many are required for whole.

Types of ECG — 1. Transesofagial disease → Electrode inside Body.
2. Surface ECG. (10 Electrodes)
3. Vectocardiogram.

Electrode VS leads :-

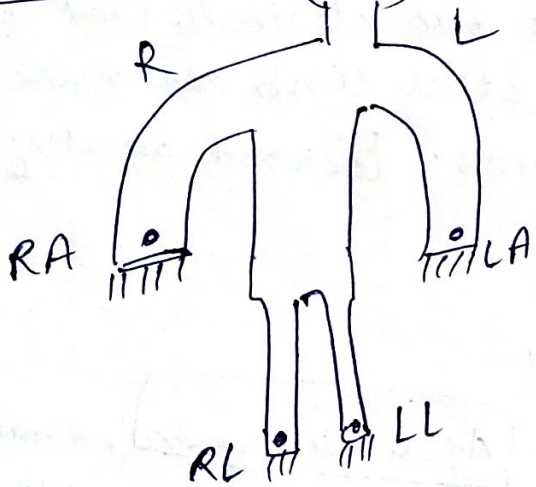
Ques) Differentiate b/w lead & Electrode.

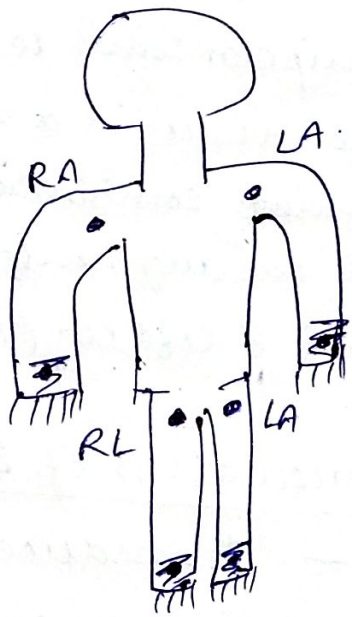
Electrode :- 10

lead :- 12 Types of leads :-

1. limb leads
2. Augmented limb leads.
3. The cordinal leads.

Limbleads :- (Bipolar leads)





I = LA − RA
II = LL − RA
III = LL − LA

Augmented limb leads :- Unipolar.

Wilson central Terminal.

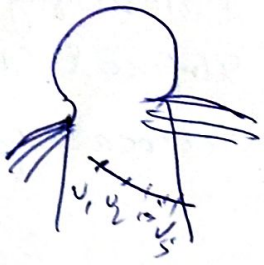
$V_W = \frac{1}{3}(LA + RA + LL)$

$aVR = RA - \frac{1}{2}(LA+LL) = \frac{3}{2}(RA - V_W)$

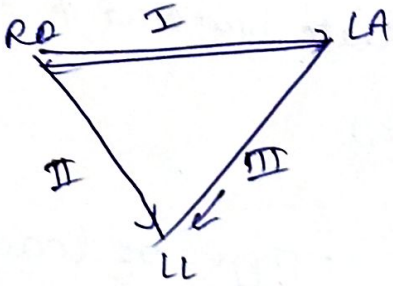
$aVL = LA - \frac{1}{2}(LL+RA) = \frac{3}{2}(LA - V_W)$

$aVF = LL - \frac{1}{2}(LA+RA) = \frac{3}{2}(LL - V_W)$

Precordial leads :-



Vectors & views :-



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Q. Augmented Electrode :-

Augmented unipolar limb leads. They are termed unipolar leads because there is a single +ve electrode that is referenced against combination of other limb electrodes. +ve electrodes for augmented leads. located on aV_L & right arm (aV_R) & left leg (aV_f).

Q.2) Instrumentation of ECG :-

I^st stage – Transducer – AgCl Electrode, that convert ECG into electrical voltage. The voltage is in the range of 1 mV ~ 5 mV.

II^nd stage :- Instrumentation Amplifier (AD624) which has a very high CMRR (90dB) & high gain (1000) with power supply (+9V) & (-9V).

III^rd → Bandpass filter