Date:

CIRCULATION IN ANIMALS

→ transport of materials within the living organism
- respiratory gases
- nutrients
- minerals
- waste materials
- hormones

* Circulatory System

1. Circulatory medium: fluid which is to be transported, also a tissue
   ↓ Blood
2. Circulatory vessels/blood vessels: pipes for conduction (arteries, veins, capillaries)
3. A pumping organ / Heart: to increase speed of transport
   ↓ central organ

BLOOD

→ fluid and also a tissue
→ has 2 main components: Plasma and Blood cells

⊖ Plasma

⇒ fluid part of blood, 90% H_2O
⇒ the H_2O increases fluidity of blood & makes it easy to move
⇒ 10% plasma proteins e.g//.
- Albemin – osmostic pressure of blood (water level)
- Immuno globins – anti-bodies

• transport of blood cells, ions, soluble food substances, hormones, carbon dioxide, urea, vitamins & plasma proteins

⇒ it contains nutrients, nitrogenous waste material (toxic)
⇒ CO_2 collected from every cell after respiration in form of Carbonic Acid H_2CO_3 which is a bicarbonate ion

DALMATIA

Date:

☆ CO_2 can't move through blood as CO_2

⇒ it has presence of toxins } Collection + Distribution
unwanted chemicals from cells

⇒ hormones as present

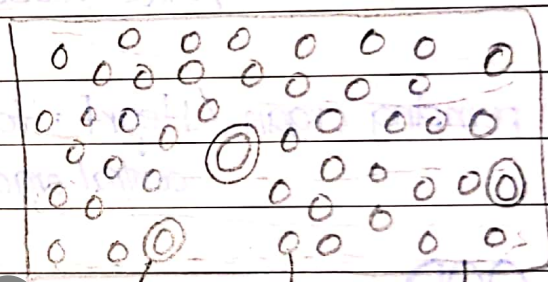
⇒ minerals (vitamins) / salts

⇒ blood acts as a medium to transport

⇒ occupies 55% of the blood

life.

→ [illegible] the bone marrow.



Glass slide with a sheet of blood

⊖ Blood Cells

→ 45% of total volume

→ they contain bone marrow

→ Stem cells are undifferentiated ⟵ RBC, WBC, Platelets

→ undifferentiated means they have the capability to divide throughout their lives

DALMATIAN

Date:

Red Blood Cells

Size : 7 – 8 µm

Number : 5 – 7 Millions / per 100cm³ of blood

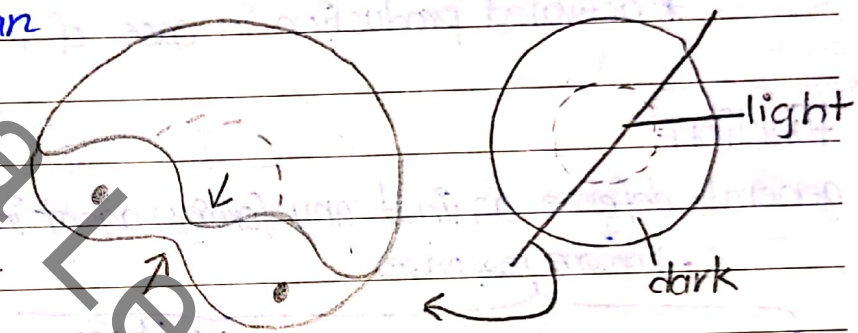
Shape & structure:

→ round in shape

→ biconcave : without a nucleus

→ there is presence of Hb (haemoglobin) at area •

→ the nucleus in present when cell is immature but dissappears in maturity due to short life span



120 Days

Function:

→ Hb + O ⇌ HbO (Oxy-hb)

purplish red — deoxygenated blood

pure bright red — oxygenated blood

low altitudes – high altitudes

brings breathlessness so no. of RBC increases and comes back to normal in normal conditions

→ carry oxygen to places where it is required

→ reaction takes place in lungs and then moves to heart to places.

↓↑ RBC : ⇒ type of physical activity

⇒ in males more no.

⇒ in females less no.

Anaemic :

low Hb – low iron

In birds it has (O) oval shape + it is nucleated

Sickle Cell anaemia:

genetic disease, uncurable, gives lethargic condition

Hb protein is disordered

→ shape of RBC

DALMATIAN

Date:

White Blood Cells

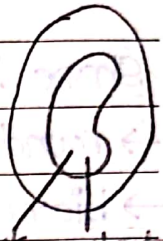
Size: 10-12 μm

Number: 4000-6000/100cm³ of blood (at a basal rate)

Shape or structure:

1. lymphocytes
   - produces anti-bodies
   - destroys microorganisms

2. monocytes
   - engulfs and destroys
   - carries out phagocytosis of disease causing organism



3. basophills
   - forms toxins against

* activated production in case of infection

Function:

general: defence against any foreign agent in body at any level

↓

- immune response

↓ activated production of anti-bodies in response to a foreign agent
→ a.b made after detection

↓ lymphocytes

↓ Phagocytosis engulfing and destroying of microorganisms
→ degrades the f.g into less harmful

↓ monocytes
→ also called macrophags (because of large size & phagocytosis)

↓ formation of toxins against the foreign agent + any material not detected by body

↓ basophills

* in organ transplants immune respone is deactivated

1 week

Date:

Platelets

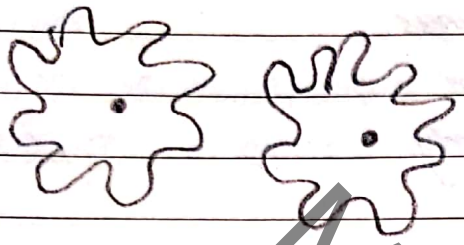
Size: 2-4 μm

Number: 15,000 - 30,000 / per 100cm³ of blood

Shape or structure:

→ irregular shaped

→ irregular fragments of cell



- Clotting of Blood to stop blood flow at point of injury
- clot entagled mass of blood vessels

Heprin – anti-clotting agent

→ does not led blood be clumped at level of injury

Functions

→ helps in the process of clotting in blood

→ not directly involved, only initiats

* they have proteins on their surface that enable them to stick to breaks in a blood vessel and clump together
* secrete proteins that makes blood clot

Prothrombokinase — Thrombokinase

Fibrinogen $\xrightarrow{Ca^{+}}$ ~~Febrin~~ Fibrin • forms long-thread like structures at level of injury

→ forms a ~~mesh~~ net at front of injury and stops blood flow

disprin and aspirin lessen the no. of platelets making it thin and reducing blood pressure.

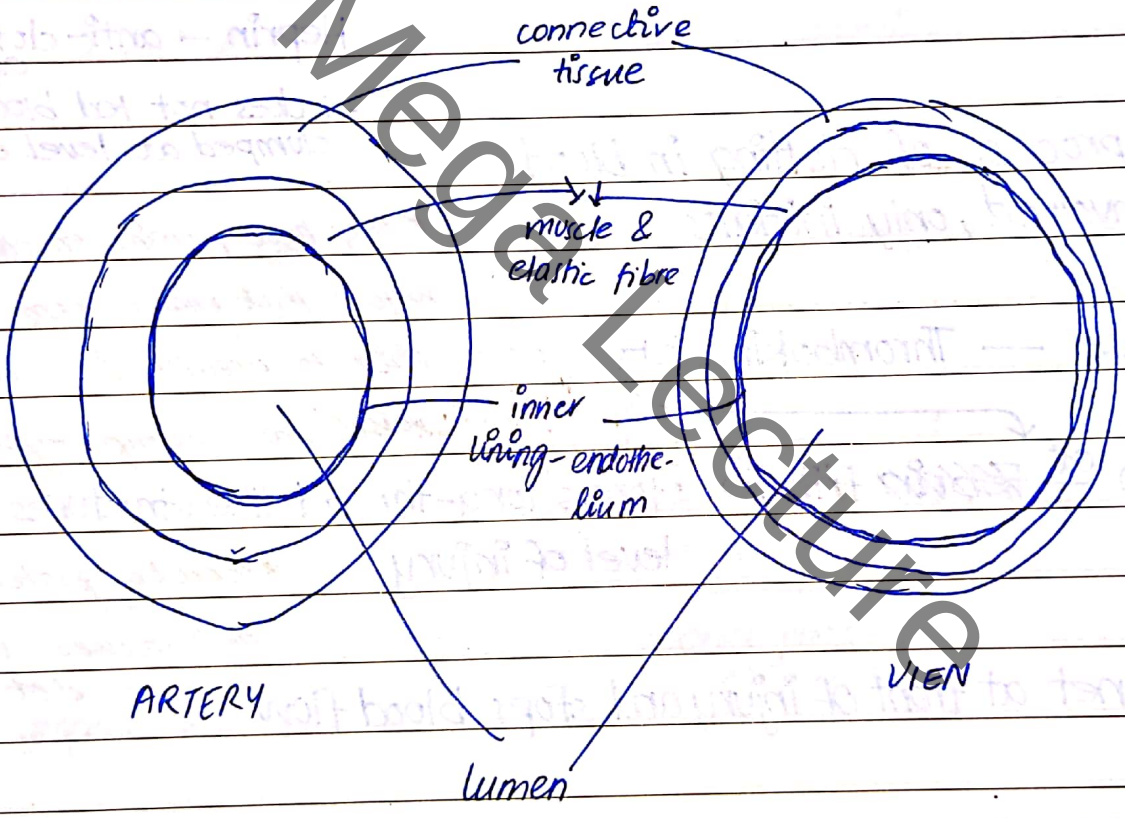
24 Days

DALMATIAN

Date:

⇒ Effect of physical activity on pulse rate:
breathing increases from 15 times a minute to 40-60 times a minute, the depth of breathing also increases

Blood vessel	ORIGIN TO DESTINATION of blood it carries
★ Vena Cava	Body to Right Atrium
★ Pulmonary Artery	Right Ventricles to lungs
★ Pulmonary Viens	Lungs to Left Atrium
★ Aorta	Left Ventricle to Body



Date:

Blood Vessels:

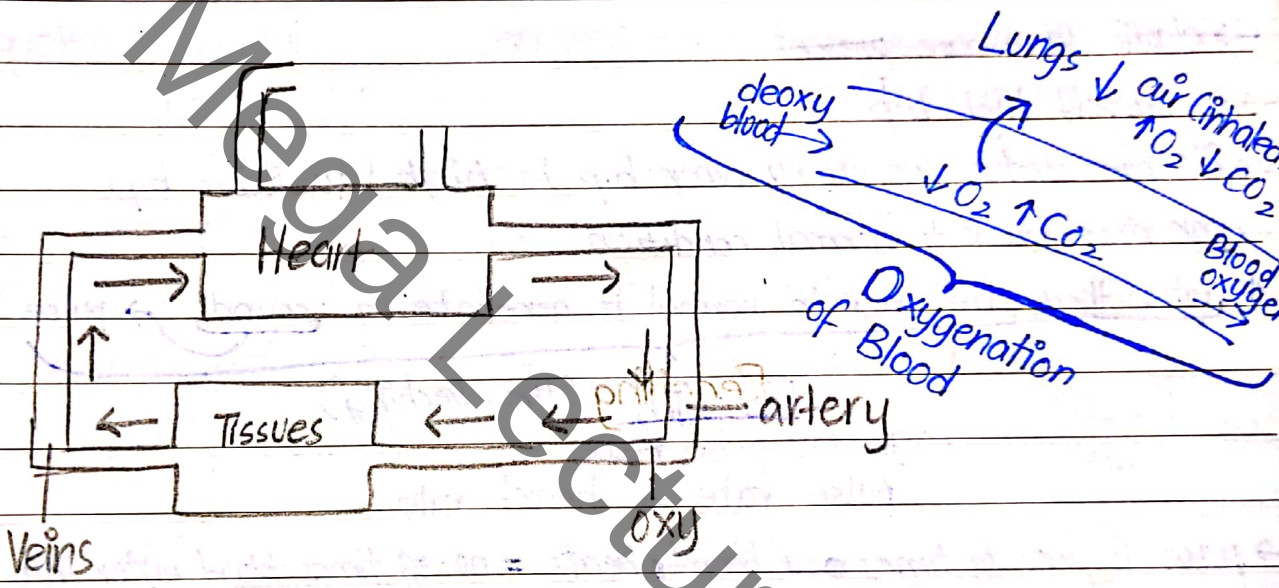
→3 types:

1. Arteries — meant for transport from the heart to the tissues (away)
2. Veins — meant for transport from the tissue level towards heart
3. Capillaries

Arteries

→ carries oxygenated blood

→ exception: pulmonary artery (from heart to lungs) ⇒ deoxygenated



→ the blood exerts a pressure

→ arteries receive blood at a very high blo pressure from heart

→ b.p declines as we move away from heart.

E.g//.

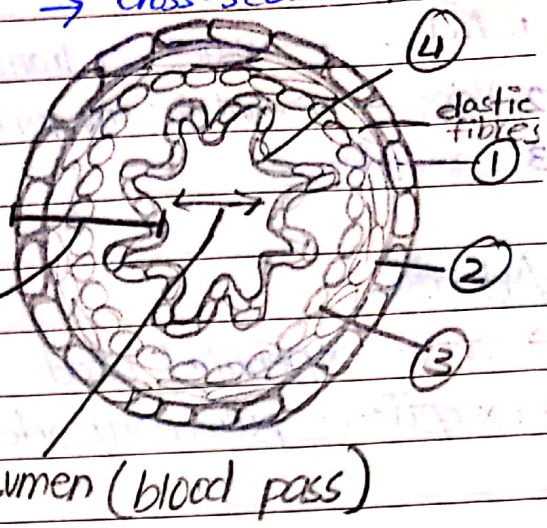
Aorta (major artery) — 120 mm of Hg (mercury)

Renal (kidney artery) — 60 mm of Hg

Date:

→ thick walls in artery to retain pressure
→ comprises of 4 layers:
i. Epidermis (outer)
ii. Circular muscles (appear as longitudnal) → 1 or 2 layers
iii. Longitudnal muscles (appear circle)
* Antagonistic pair: act opposite – pushing blood
iv. Endodermis (inner)
→ arteries receive blood at high pressure

→ Cross-section of Wall:



→ elastic fibres are present
→ to support high b.p
→ it can stretch the artery when b.p is high, sustains b.p
→ can move back to normal condition
* when they come back to normal it generate a sound → pulse

Recoiling (the streching)
→ gives us pulse ~~rate~~
pulse rate = heart rate

→ pulse is no. of times our heart beats = no. of times blood enter into aorta

→ size of lumen is smaller in artery / narrower because of thick walls + folded endodermis
→ maintains pressure till extreme points / tissue
→ ↓ speed of blood
→ it moves in one direction because of coiling.

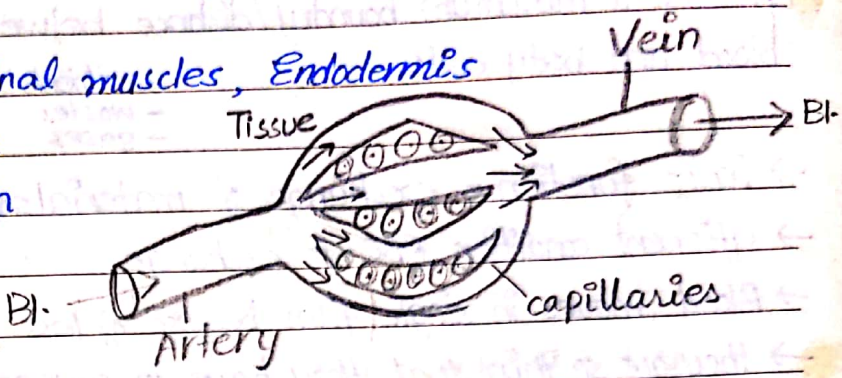
* thick, muscular, elastic walls
* & connective tissues provide strength

DALMATIAN

Date:

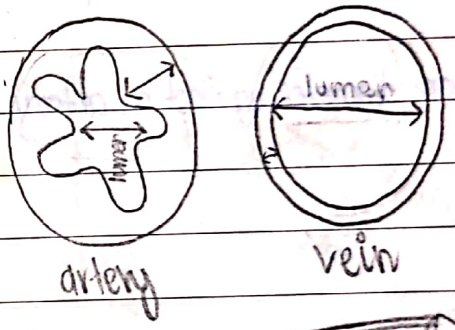
Veins

→ take blood from tissues towards heart
→ carries deoxygenated blood towards heart (except pulmonary)
→ same 4 layers as arteries:
Epidermis, Circular muscles, Longitudnal muscles, Endodermis
- Smooth muscle
* it has smooth endodermis, though
* no elastic fibres required
(no need to resist b.p)

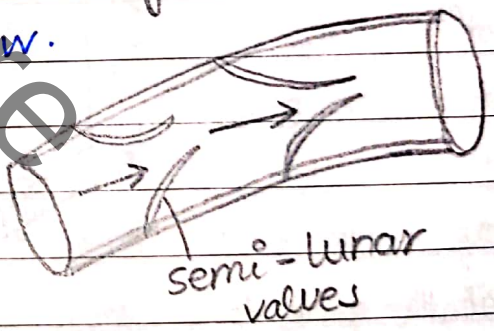


artery — arterioles — capillaries — venules — vein
× ×
(at level of tissues)
(pressure is ~~minimum~~ zero)
to allow exchange material
(pressure is minimum)
(enters blood at a very low speed)

→ that is why we don't need thick walls because veins receive blood at minimum pressure
→ wide lumen as compared to an artery
→ more blood/per unit time moves to heart



— shutting doors at intervals to prevent back flow.
valves
* have less connective tissue than artery
* has thin wall — less muscular tissue than arteries

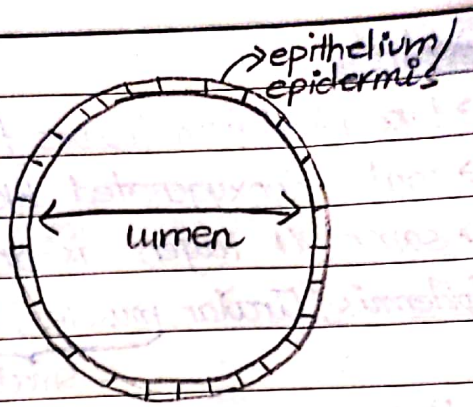


DALMATIAN

Date:

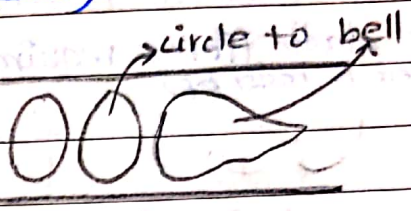
Capillaries

→ one walled, thin blood vessels



• provides a minimum boundry/distance between blood and body cells
- nutrients
- wastes
- gases

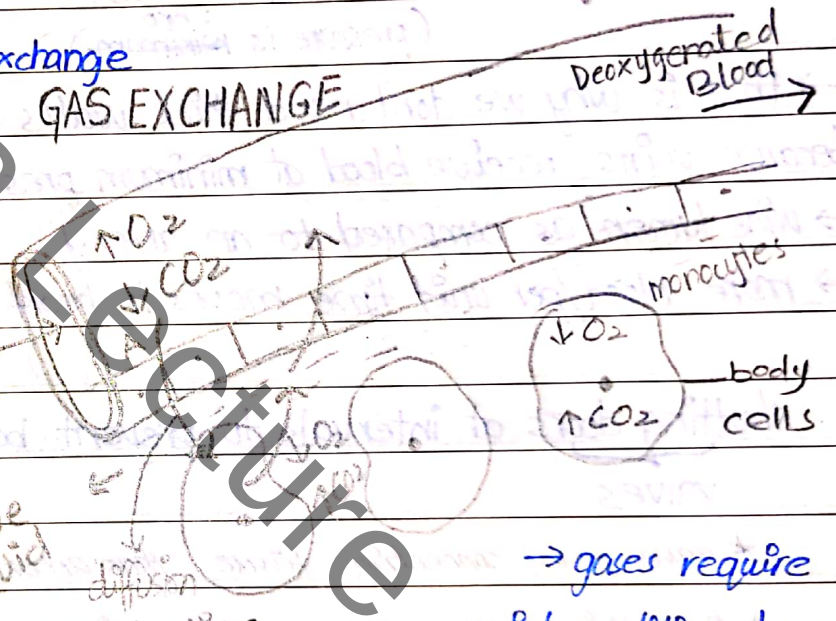
→ basic function = exchange of materials (⇌)
→ effiecent condition RBC to exchange
→ Blood moves in single film because of less diameter
→ they are so thin that they have to squeeze through them. (circle - bell)



(better exchange)

→ there is zero blood pressure
→ ample time for exchange

GAS EXCHANGE



* more diameter against an artery

Gas
A. Diffuses into
↑ and dissolves
moves to cells

(helps diffusion of gases)

→ oxygen moves first because of more concentration
→ at the same time waste materials are also moving

→ gases require moist condition to diffuse into cells or out.

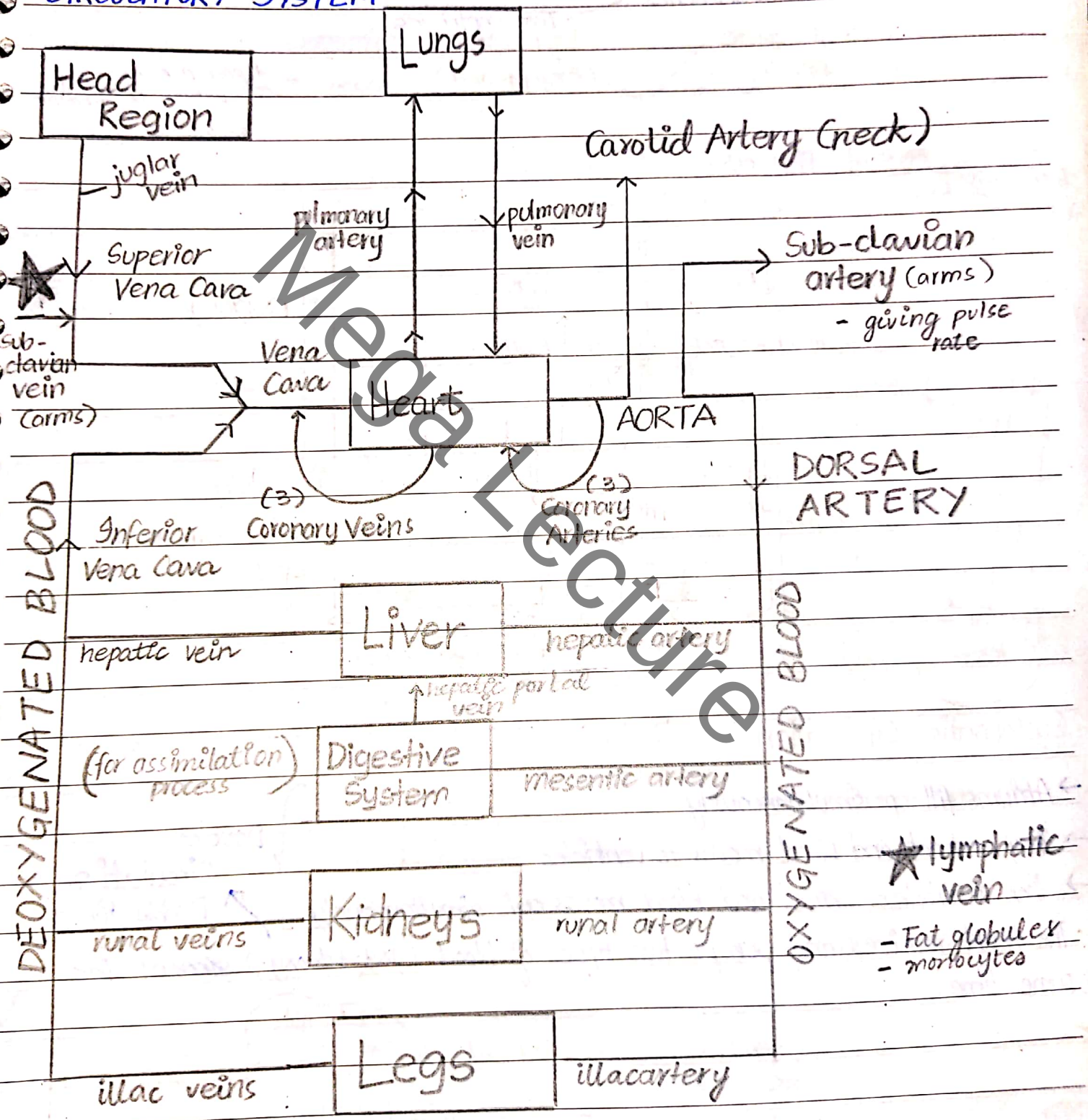
→ blood leaves deoxygenated meaning higher concentration of CO_2 (higher concentration of waste)
* blood always has presence of CO_2 and O_2, the % age varies.
→ water is also moving (it is taken back with lymphatic vessels)
→ monocytes can squeeze through epithelium and engulfs microorganisms at tissue level. (into tissue fluid) (taken back by lymphatic vessels)

DALMATIAN (degrading takes place in nodes (armpits))

Date:

monocytes: (phagocytosis) — (moves into lymphatic vessels) — lymph nodes → (blood)

CIRCULATORY SYSTEM



DALMATIAN

Date:

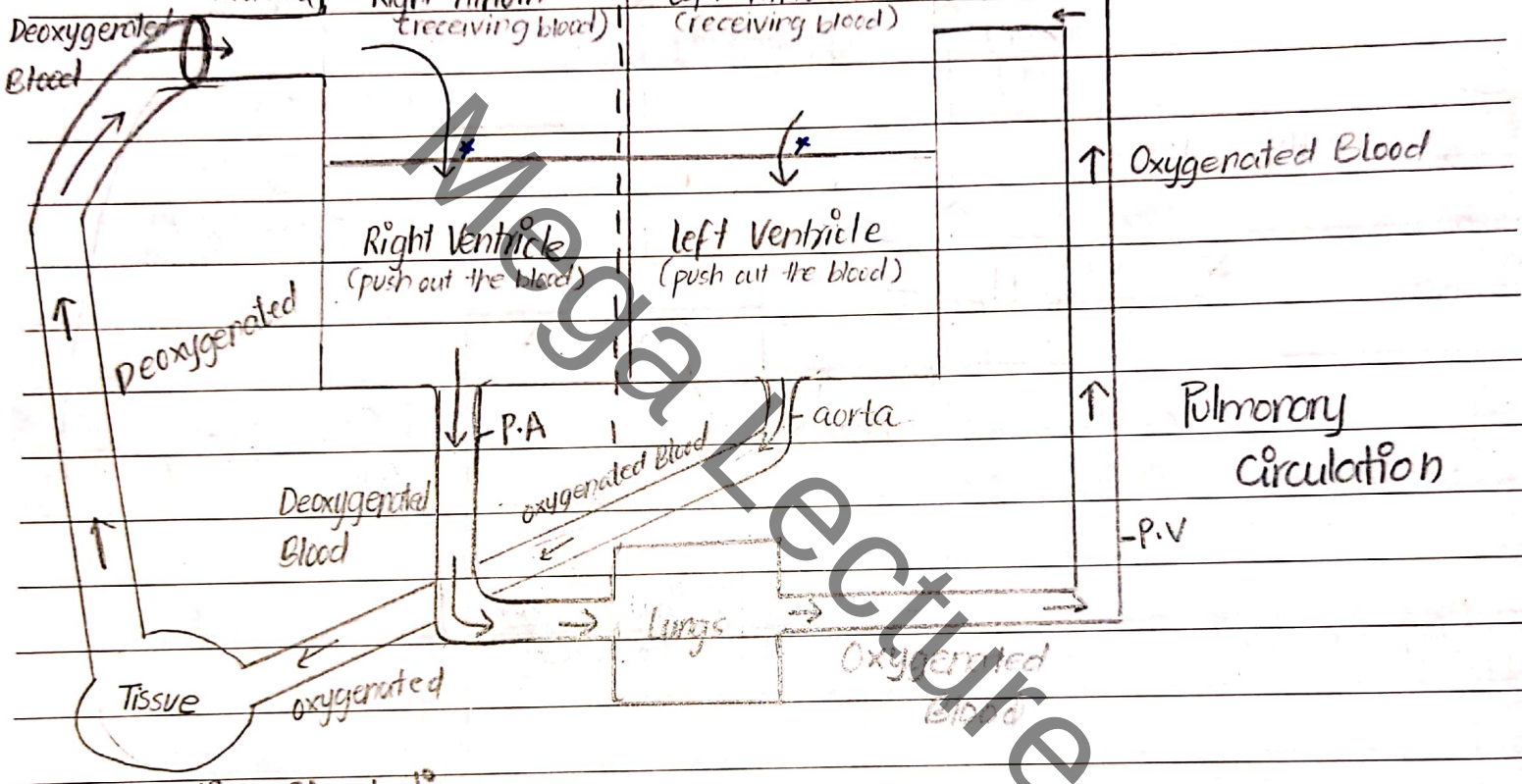
HEART

→ Mammals

→ 4 chambers/parts/compartments < Two auricles/atria (atrium); Two ventricles

Right Side (Deoxygenated) | Left side (Oxygenated)

*presence of valves to prevent backward flow



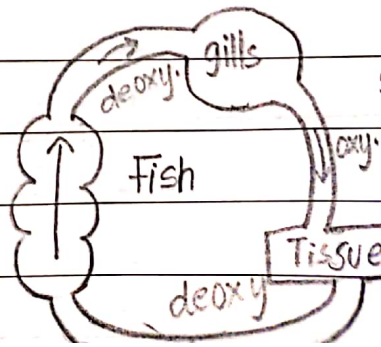
Systematic Circulation

→ Atriums fill up simulataneously
→ They contract and blood moves to ventricles
→ Then ventricles contract and blood moves out simultaneously

} Double Circulation / Double Pump

• The heart receives and pumps two types of blood (oxy. + deoxy.) at the same time.

- same type is received and pushed out.



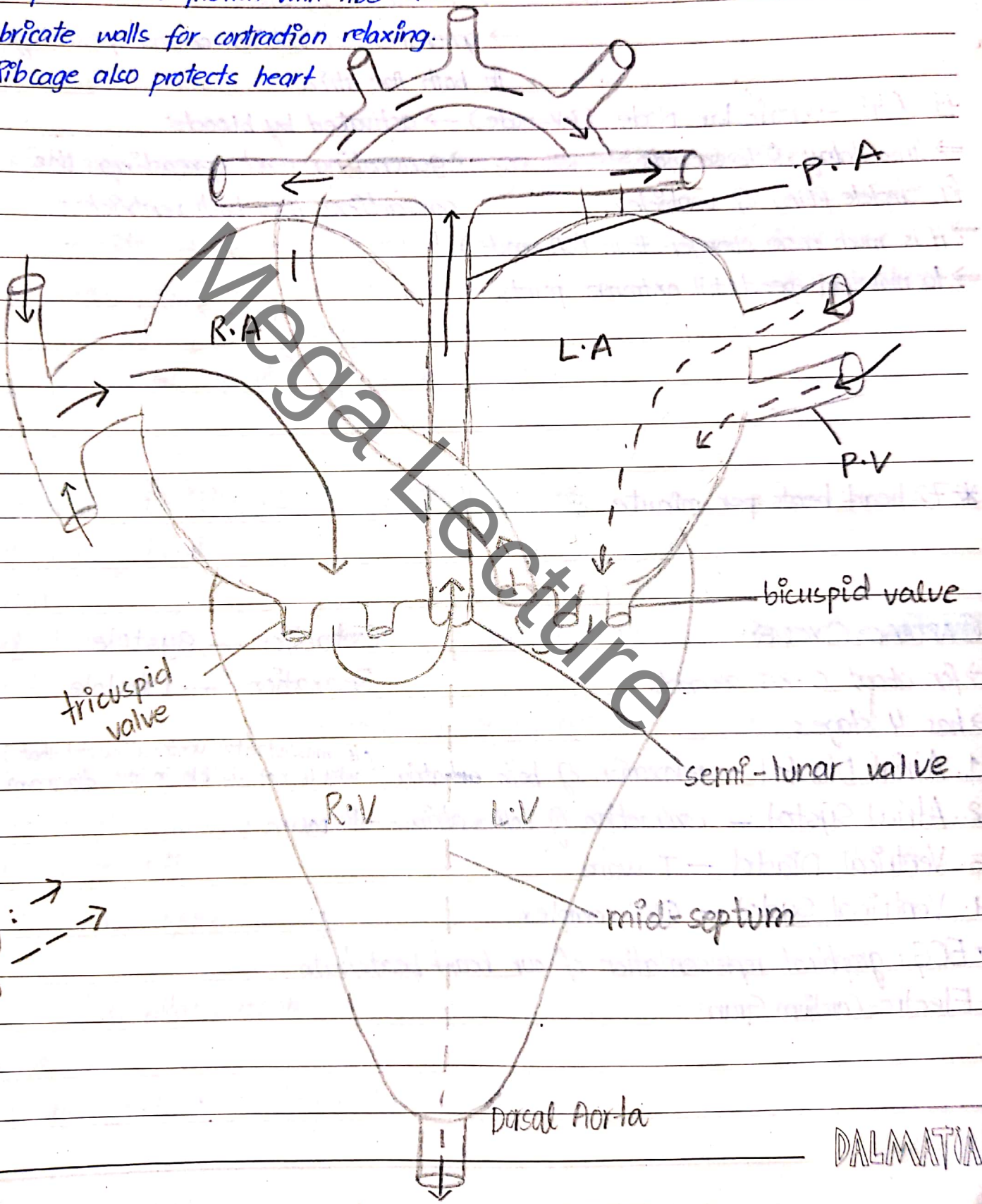
Single Pump / Single Circulation

DALMATIAN

Date:

→ Pericardium : (covering the heart)
a transparent double membrane having a fluid in center called the pericardial fluid.
- the fluid avoids friction with ribs and
- lubricate walls for contraction relaxing.

→ Ribcage also protects heart



DALMATIAN

Date:

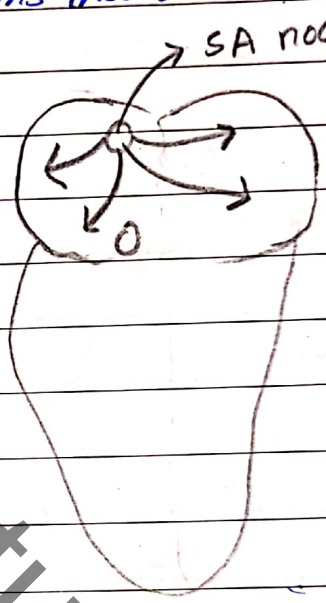
Function.

→ pumps blood with the help of cardiac muscle – Pace Maker

Pace Maker:

j. Sino-atrial Node (SA-node) → activated by blood
→ generates contraction and spreading in both the atria

jj. Atrio-ventricular Node (AV-node) → activated by blood
⇒ time delay 0·13 seconds for complete filling of ventricles
→ generating and spreading the contractions into both ventricles
→ it is much more stronger than (SA-node)
⇒ to maintain speed till extreme points



*72 heart beats per minute

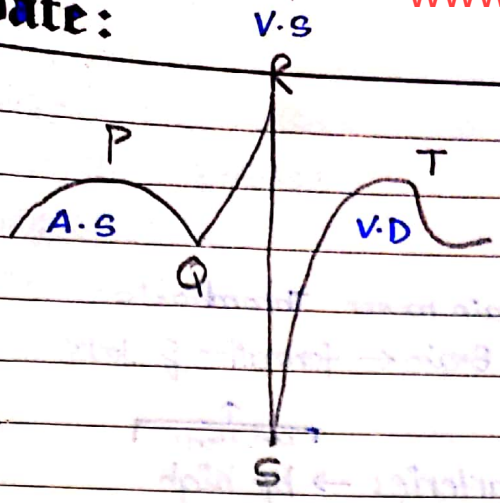
CARDIAC CYCLE:

Contraction – Systole
Relaxation – Diastole

→ for about 0·85 seconds
→ has 4 stages
1. Atrial Diastol – relaxation of both atria (is massed into ventrical systol that is why is not visible in the diagram)
2. Atrial Systol – contraction of both atria – P wave
3. Ventrical Diastol – T-ware
4. Ventrical Systol – QRS complex

→ ECG: graphical representation of our heart beats/rate
Electro-Cardium Gram

Date:



• ventricles give large area because of stronger ventricle contraction

→ the development of heart is the last stage in embryonic life

→ blue baby syndrome: heart not developed properly thus can't involve physical activity

→ 1 cardiac cycle = 1 heart beat.

DISORDERS OF THE CIRCULATORY SYSTEM

At the level of blood:

Anemia:

→ lack of iron giving us lack of Hb • iron supplement can cure it

→ results in lack of RBC

→ lethargic (less energy released for body functions) condition

Sickle-cell Anemia:

→ abnormal Hb chemical, genetic disorder • uncurable (only intensity can be decreased)

→ sickle shape RBC

→ gives us less oxygen carrying capacity

At the level of blood plasma:

Haemophilia:

→ fatal and abnormal clotting factor in blood plasm • uncurable

Date:

→ results in no clotting of blood after injury
→ genetic disorder

At the level of blood vessels:
Artriosclerosis:
→ more evident in case of arteries
→ reasons: ① more fats in diet, forming layers in arteries → bp high

(brain haemor Thrombosis
Brain ← formation of clots
↑ consistent

Bp: force with the blood cells strike with the walls

→ ruptured walls as a result, internal injury
→ clotting activates
→ affects brain and heart (coronary arteries)

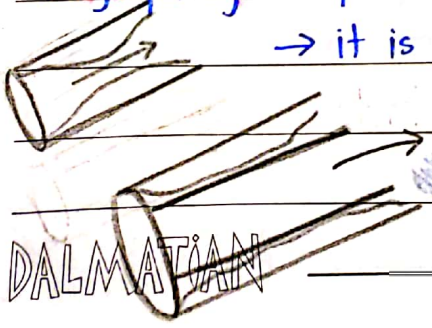
Hight B.P } Thrombosis (formation of clots)
↓
- Heart stroke
- Heart Attack
- Angina (dil se bazo tak dard)

↓
- Brain Haemorrahge (In Brain)
- Paralysis

↑ B.P — diabetic (less fluidity) · (less glucose level)
— hyper tension · (therapy)
— nicotin (cigaretter · (avoid harmful drugs)

when 2 out 3 coronary arteries are blocked: (Surgical Procedures)

- Angiography: → identification of blocked arteries through this test
→ probe with a camera from abdomen is passed
- Angioplasty: → probe sent again with a baloon
→ it is inflatted at level of blockage } stunt



Date:

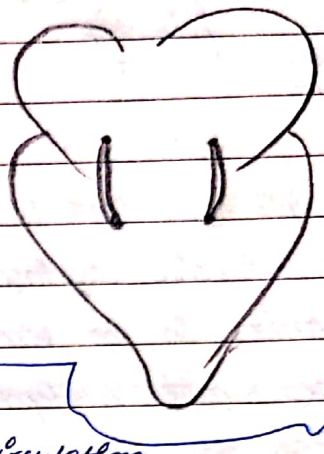
- Open heart Surgery / Bypass :

→ develop a new route

→ require a blood vessel

→ take out a blood vessel from leg (a new one will come their)

→ stitched at the level of heart



- less use of fats
- use saturated fats
- increase physical activity (metabolise)

The heart manages systematic circulation & pulmonary circulation

systematic circulation → high pressure to maintain blood flow till extreme points

pulmonary circulation → low pressure b/c lungs close to the heart pressure optimum for diffusion of gases

* the walls of the left ventricle are thicker than that of the right ventricle

* pressure in veins is even slower than pressure in capillaries — otherwise blood would not drain out of the capillary into the vein