

CIRCULATORY SYSTEM

Night Before the Exam

1) BIG IDEA

- A closed transport system = **Heart + Blood + Blood vessels**
- Functions:** transport O_2 and nutrients, remove CO_2 and wastes, transport hormones, help in defence, help in clotting, distribute heat.

2) BLOOD VESSELS

Artery = Away | Vein = Visits the heart | Capillary = Exchange

Arteries

- carry blood away from the heart
- thick, muscular, elastic wall
- high pressure
- usually oxygenated
- exception:** pulmonary artery carries deoxygenated blood to the lungs



Artery
(thick wall)

Veins

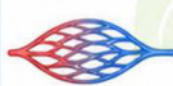
- carry blood toward the heart
- thinner wall, wider lumen
- low pressure
- contain valves
- usually deoxygenated
- exception:** pulmonary vein carries oxygenated blood to the heart



Vein
(with valve)

Capillaries

- microscopic vessels connecting arteries and veins
- wall is one cell thick
- site of exchange of gases, nutrients and wastes



Capillary
(one cell thick)

Important: Artery and vein are named by direction, not oxygen content.

3) BLOOD

Blood = Plasma + RBCs + WBCs + Platelets

Plasma

- pale yellow fluid
- about 55% of blood
- transports nutrients, hormones, salts, proteins and wastes
- albumin:** water balance
- globulins:** transport + defence
- fibrinogen:** clotting

RBCs

- formed in red bone marrow
- biconcave discs
- no nucleus
- contain haemoglobin
- lifespan about 120 days
- function: transport oxygen
- haemoglobin contains iron

WBCs

- have a nucleus
- function: defence against pathogens
- some perform phagocytosis

Platelets

- small cell fragments
- function: blood clotting

Clotting sequence:

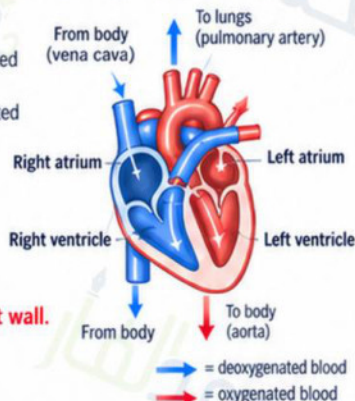
Injury → Thromboplastin → Prothrombin → Thrombin → Fibrinogen → Fibrin → Clot

4) THE HEART

- A muscular organ in the chest between the lungs, slightly to the left.

The 4 chambers:

- Right atrium:** receives deoxygenated blood from the body
- Right ventricle:** pumps deoxygenated blood to the lungs
- Left atrium:** receives oxygenated blood from the lungs
- Left ventricle:** pumps oxygenated blood to the whole body



★ Left ventricle has the thickest wall.

→ = deoxygenated blood
→ = oxygenated blood

5) VALVES

- Valves prevent backflow and keep blood moving in one direction.
- Tricuspid:** between right atrium and right ventricle
- Pulmonary valve:** between right ventricle and pulmonary artery
- Mitral (bicuspid):** between left atrium and left ventricle
- Aortic valve:** between left ventricle and aorta
- Veins also contain valves.

6) BLOOD FLOW STORY

Body → Venae cavae → Right atrium → Tricuspid valve → Right ventricle → Pulmonary artery → Lungs → Pulmonary veins → Left atrium → Mitral valve → Left ventricle → Aorta → Body

- Pulmonary circulation:** Right ventricle → lungs → Left atrium
- Systemic circulation:** Left ventricle → body → Right atrium

7) CARDIAC CONDUCTION

Who starts the heartbeat?

SA node → atria contract → AV node → Bundle of His → Purkinje fibres → ventricles contract

- SA node** = natural pacemaker
- located** in the right atrium
- AV node** receives and relays the impulse
- medulla oblongata regulates heart rate but does not start the heartbeat.

8) BLOOD PRESSURE & NUMBERS

- normal pulse: **60–100 beats/min**
- normal blood pressure: **120/80 mmHg**
- systolic** = ventricular contraction
- diastolic** = ventricular relaxation
- measured by a sphygmomanometer.



9) BLOOD GROUPS

Group	Antigen(s)	Antibody(ies)	Gives to	Receives from
A	antigen A	anti-B	A, AB	A, O
B	antigen B	anti-A	B, AB	B, O
AB	antigens A and B	no antibodies	AB	A, B, AB, O
O	no antigens	anti-A and anti-B	A, B, AB, O	O

Rh present = positive (+)

Rh absent = negative (–)

Important: O– = universal donor | AB+ = universal recipient

- Agglutination** = clumping due to incompatible blood transfusion.

10) IMPORTANT DISORDERS

- Atherosclerosis:** fatty deposits narrow arteries and reduce blood flow
- Haemophilia:** inherited disorder in which normal clotting is impaired
- Sickle cell anaemia:** sickle-shaped RBCs may block capillaries

FINAL QUICK RECALL

- Artery = Away
- Vein = Visits the heart
- RBC = O_2 transport
- WBC = Defence
- Platelets = Clotting
- Right heart → lungs
- Left heart → body
- SA node = pacemaker
- Pulmonary artery = deoxygenated
- Pulmonary vein = oxygenated
- Left ventricle = thickest wall