FREE NOTES · NCERT + NEET LEVEL

Body Fluids & Circulation

Blood ki banawat, blood groups (ABO, Rh), coagulation, lymph, circulatory pathways, human heart, cardiac cycle, ECG, double circulation, regulation aur bimariyan.

01 Blood
02 Blood groups aur coagulation
03 Lymph aur circulatory pathways
04 Human heart
05 Cardiac cycle aur ECG
06 Double circulation, regulation, bimariyan
07 Extra + tricks
08 Important Q&A
09 Common mistakes
10 Practice (NEET style)
11 Quick revision

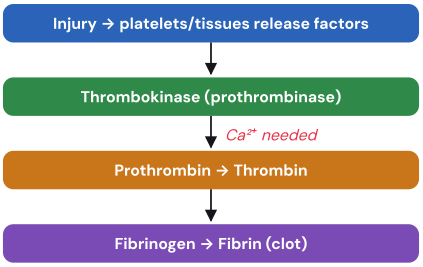
01 Blood

Component	Facts
Plasma (55%)	90–92% paani, 6–8% proteins: fibrinogen (clotting), globulins (suraksha), albumins (osmotic balance); glucose, amino acids, lipids, minerals bhi. Bina clotting factors ka plasma = **serum**
RBC (erythrocytes)	5–5.5 million/mm³; red bone marrow me; nucleus nahi (zyada tar mammals), biconcave; haemoglobin 12–16 g/100 mL; umar ~120 din; spleen me khatam (RBCs ka kabristan)
WBC (leucocytes)	6000–8000/mm³; nucleus wale. Neutrophils (60–65%, sabse zyada, phagocytic), eosinophils (2–3%, allergy), basophils (sabse kam, 0.5–1%, histamine, serotonin, heparin), lymphocytes (20–25%, B aur T, immunity), monocytes (6–8%, phagocytic)
Platelets (thrombocytes)	1.5–3.5 lakh/mm³; megakaryocytes se; clotting ke factors chhodte

02 Blood groups aur coagulation

Group	RBC pe antigen	Plasma me antibody	Kisse le sakta
A	A	anti-B	A, O
B	B	anti-A	B, O
AB	A, B	koi nahi	Sabse (universal recipient)
O	koi nahi	anti-A, anti-B	O (universal donor)

Rh factor: ~80% log Rh+. Rh- maa aur Rh+ bachcha: pehli pregnancy theek (placenta alag rakhta); delivery pe maa anti-Rh antibodies banati; agla Rh+ bachcha **erythroblastosis foetalis** (anaemia, jaundice). Pehli delivery ke baad maa ko anti-Rh antibodies dekar bachav.



Coagulation ka cascade

03 Lymph aur circulatory pathways

- **Lymph** (tissue fluid): plasma jaisa par kam proteins, bade proteins nahi; lymphocytes hote. Lymphatic vessels se badi veins me. Aant ke villi ke **lacteals** se sokhi fat le jaata.
- Open circulation: arthropods, molluscs. Closed: annelids, chordates.
- Hearts: machhli 2-chamber (single circulation: sirf deoxygenated blood); amphibians aur zyada reptiles 3-chamber (mixed blood, adhoori double circulation); crocodiles, birds, mammals 4-chamber (poori double circulation).

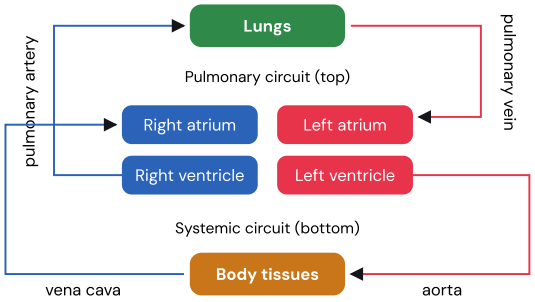
04 Human heart

- Mesoderm se, thoracic cavity me lungs ke beech, thoda left; mutthi jitna; do parat wala **pericardium**, pericardial fluid.
- 4 chambers; interatrial, interventricular, atrio-ventricular septum. Valves: **tricuspid** (right AV), **bicuspid/mitral** (left AV), pulmonary artery aur aorta pe **semilunar**. Valves ek taraf flow.
- Nodal tissue: **SAN** (right atrium ka upar right kona, **pacemaker**, 70–75 action potentials/min), **AVN** (right atrium ka neeche left kona), AV bundle (bundle of His) → right aur left branches → **Purkinje fibres**.
- Heart muscle khud excite hota (myogenic heart).

05 Cardiac cycle aur ECG

- Cardiac cycle = 0.8 s (72 beats/min). Joint diastole → SAN fire → atrial systole (ventricles me ~30% aur blood) → ventricular systole (AV valves band: **lub**; semilunar khule) → ventricular diastole (semilunar band: **dub**).
- **Stroke volume** ~70 mL; **cardiac output** = stroke volume × heart rate ≈ 70 × 72 ≈ 5000 mL/min (5 L). Athletes me zyada.
- **ECG**: **P wave** = atria ka depolarisation (atria sikudte); **QRS complex** = ventricles ka depolarisation (ventricles sikudna shuru); **T wave** = ventricles ka repolarisation (systole khatam). Minute me QRS gino = heart rate.

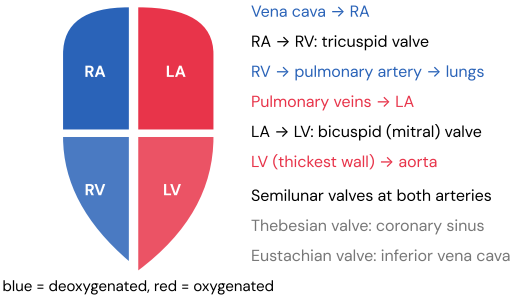
06 Double circulation, regulation, bimariyan



Insaan me double circulation

- **Hepatic portal system**: hepatic portal vein aant se liver tak blood. Coronary system heart muscle ko blood.
- Regulation: medulla oblongata me neural centre; sympathetic nerves rate aur taakat badhate; parasympathetic ghatate; adrenal medulla ke hormones output badhate.
- Bimariyan: **hypertension** (≥140/90; normal 120/80), **coronary artery disease**/atherosclerosis (Ca, fat, cholesterol, fibrous tissue jamna), **angina** (heart muscle ko kam O_2 se seene me dard), **heart failure** (theek pump nahi; lungs me congestion; heart attack ya cardiac arrest se alag).

07 Extra + tricks



Heart me khoon ka raasta

Phase	Samay (0.8 s cycle)
Atrial systole	0.1 s
Ventricular systole	0.3 s
Joint diastole	0.4 s

- Granulocytes (neutrophil, eosinophil, basophil) vs agranulocytes (lymphocyte, monocyte). WBC kram (zyada se kam) ka trick: "**N**ever **L**et **M**onkeys **E**at **B**ananas" = Neutrophils, Lymphocytes, Monocytes, Eosinophils, Basophils.
- **Myocardial infarction** (heart attack): achanak khoon na milne se heart muscle kharab. **Cardiac arrest**: dhadkan ruk jaana. **Heart block**: SAN/AVN ka impulse ruk jaata; artificial pacemaker.
- Pehli delivery ke baad Rh- maa ko anti-Rh injection = **RhoGAM** (anti-D).

- Blood vessels: arteries (moti, lachkeeli, heart se door), veins (patli, valves, heart ki taraf), capillaries (ek cell moti).

08 Important Q&A

Q1. O universal donor kyun?

O ke RBCs pe A ya B antigen nahi, isliye recipient ke antibodies chipkate nahi.

Q2. Stroke volume 70 mL aur heart rate 72/min ho to cardiac output?

70 × 72 = 5040 mL ≈ 5 L/min.

Q3. QRS complex kya dikhata?

Ventricles ka depolarisation, ventricular contraction shuru.

09 Common mistakes

- Lub ko semilunar valves se kehna (AV valves band = lub; dub = semilunar).
- Basophils ko sabse zyada WBC likhna (neutrophils hain).
- Heart failure aur cardiac arrest mix karna.
- Kehna ki serum me fibrinogen.

10 Practice (NEET style)

1. Heart ka pacemaker?
2. Cardiac cycle kitni der?
3. Universal recipient?
4. Clotting me kaunsa ion?
5. RBCs ka kabristan?

ANSWERS

1) SA node · 2) 0.8 s · 3) AB · 4) Ca^{2+} · 5) Spleen

11 Quick revision: exam se 5 minute pehle

BLOOD

- RBC 120 din
- Neutrophils sabse zyada, basophils kam
- Serum = plasma − clotting factors

GROUPS

- O donor, AB recipient
- Rh− maa: erythroblastosis

HEART

- SAN → AVN → His → Purkinje
- Lub AV, dub semilunar
- CO ≈ 5 L/min

ECG

- P atrial
- QRS ventricular depol.
- T ventricular repol.

Koi doubt? padhaiadda.netlify.app pe AI Doubt Solver se poocho, ya is chapter ka mock test do.