THE BLOOD

1. In human body system operates to maintain pH of blood plasma [GPAT-2022]

(a) The acetate buffer
(b) The lysis buffer
(c) The potassium citrate
(d) The carbonic acid

2. Blood grouping is basically possible because of the presence of following [GPAT-2022]

(a) Antigens on RBCs
(b) MHCs on WBCs
(c) MHCs on RBCs
(d) Antigens on WBCs

3. When RBCs are kept in isotonic NaCl solution [GPAT-2022]

(a) There will not be any movement of solutes across the RBC membrane
(b) The RBC shape and size will not change
(c) Because the osmotic pressure across the membrume is same the solutes will not crossacross the RBC membrane
(d) All of these

4. Hemophilia A is caused due to the reduction in the quantity or activity of which of the following [GPAT-2021]

(a) Vitamin-K
(b) Clotting factor IV
(c) Clotting factor-VIII
(d) Clotting factor IX

5. Which of the following cells are called scavenger cells [GPAT-2019]

(a) Neutrophils
(b) Natural killer cells
(c) Macrophages
(d) Mast cells

6. The process by which the furmed elements of blood develop is called as hemopoiesis. In the process of hemopoiesis the stem cells are converted in to myeloid stem cell and subsequently differentiated and are developed into precursor cells. Match the following precursor cells with the formed elements of blood from which they are formed. [GPAT-2017]

Precursor Cell	Elements of Blood
1. Reticulocyte	(P) Platelets
2. Megakaryoblast	[Q] Macrophages
3. Myeloblast	[R] Erythrocytes
4. Monoblast	[S] Neutrophils

(a) 1-(R) 2-[P] 3-[S], -[0]
(b) 1-(P), 2-(R), 3-[Q]+[S]
(c) 1-[Q]. 2-[S], 3-[R]. 4[P]
(d) 1-[S]. 2-[Q] 3-[P]. 4-[R]

7. Which one is correct [GPAT-2016]

(a) Blood = Plasma RBC+WBC Blood platelets
(b) Lymph = Plasma + RBC+WBC
(c) Neuron = Cyton Dendrite Axon + Synapse
(d) Plasma = Blood lymphocytes

8. Match the following [GATE-2009]

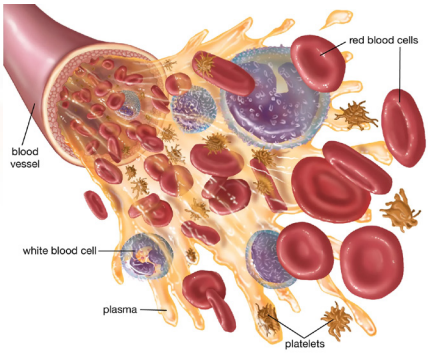
Group 1 Condition I	Group II Description II
1. Agranulocytosis	[P] Reduced lifespan of erythrocytes
2. Anisocytosis	[Q] Lack of neutrophils
3. Aplastic anemia	[R] Abnormal variation in RBC size
4. Hemolytic anemia	[S] Depression of synthesis of all cell typesin bone marrow

(a) 1-[Q]. 2-[R]. 3-[S]. 4-[P]
(b) 1-[Q], 2-[S], 3-[R], 4-[P]
(c) 1-[P], 2-[Q], 3-[S], 4-[R]
(d) 1-[S], 2-[Q], 3-[P], 4-[R]

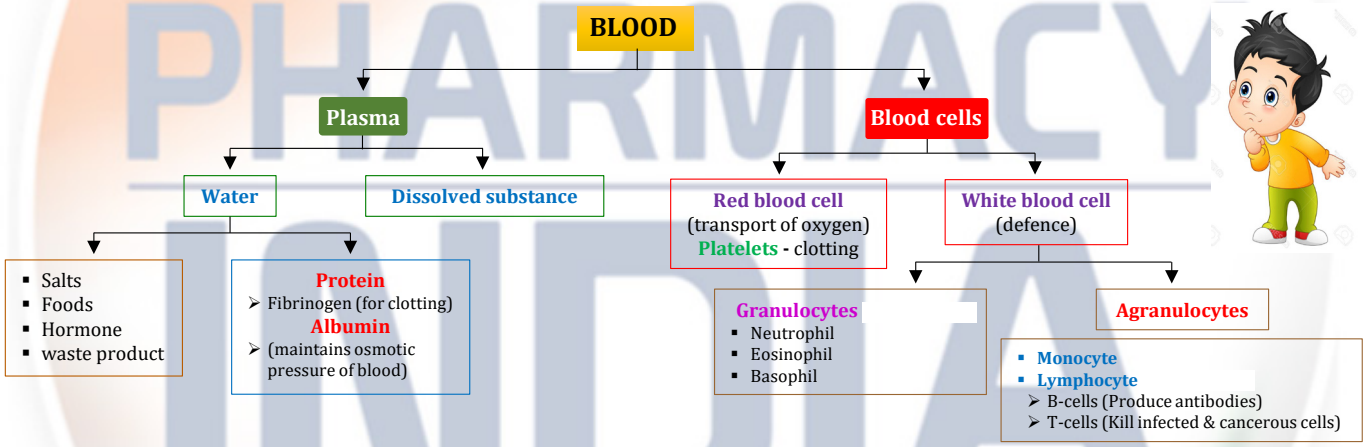
THE BLOOD

BLOOD: ITS COMPOSITION AND FUNCTIONS

Feature	Description
Definition	Blood is a fluid connective tissue.
Transport Function	• Oxygen from lungs → tissues • CO_2 from tissues → lungs • Nutrients from alimentary tract → tissues • Wastes → excretory organs (mainly kidneys)
Colour	Scarlet red (oxygen-rich), Dull red (oxygen-poor)
Percentage of Body Weight	~7% of total body weight
Volume	**Male:** 5–6 L **Female:** 4–5 L
pH	7.35 – 7.45
Temperature	38°C (100.4°F)
Osmolality	280 – 300 mOsm/L



☐ BLOOD CLASSIFIATION FLOW CHART



☐ PLASMA & PLASMA PROTEINS

Feature	Description
Plasma	Fluid portion of blood containing 90–92% water and dissolved/suspended substances.
Constituents of Plasma	• Plasma proteins • Inorganic salts • Nutrients (from digested food) • Waste materials • Hormones • Gases
Plasma Proteins	~7% of plasma; too large to pass through capillary pores, hence retained in blood.
Types of Plasma Proteins	• Albumins • Globulins • Fibrinogen
Functions of Plasma Proteins	• Maintain osmotic pressure of blood (fluid balance) • Help in heat regulation • Contribute to immunity & clotting (via globulins and fibrinogen)

☐ BLOOD CELLS/ CORPUSCLES

- Synthesised mainly in red bone marrow.
- The process of blood cell formation is called haemopoiesis.
- In adults, haemopoiesis mainly occurs → in the skeleton is confined to flat bones, irregular bones and the ends (epiphyses) of long bones (main sites→ sternum, ribs, pelvis and skull).

☐ There are three types of blood cell:

- Erythrocytes (red cells)
- Platelets (thrombocytes)
- Leukocytes (white cells)

ERYTHROCYTES (Red Blood Cells 45%)

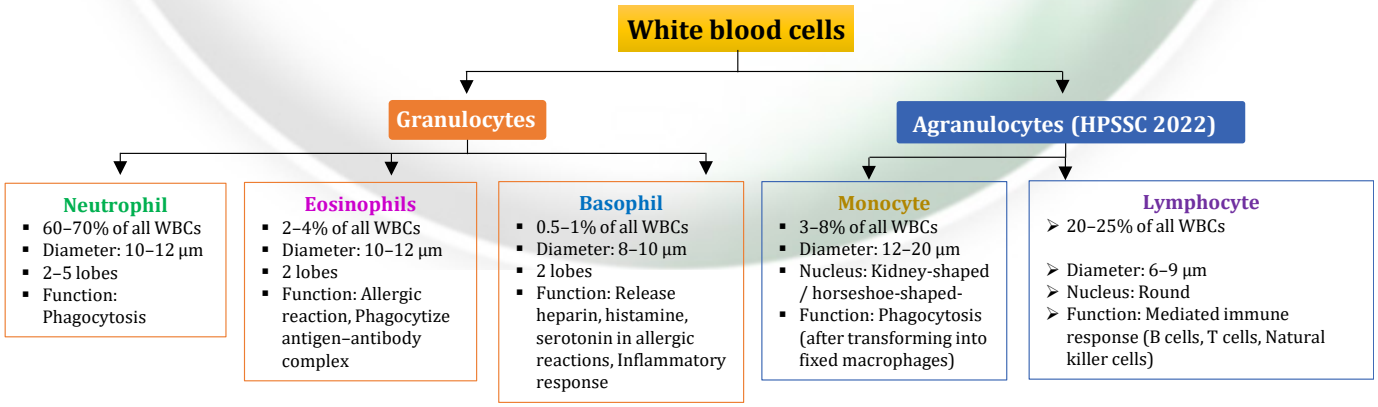
Feature	Description
Appearance	Biconcave discs → ↑ surface area for gas exchange; thin center allows rapid diffusion of gases.
Structure	• Filled with hemoglobin (binds O_2 & CO_2) • Lack intracellular organelles.
Hemoglobin Content	**~280 million molecules per RBC,** each with 4 heme chains (iron-containing).
Life Span	**~120 days.**
Destruction Site (Graveyard of RBCs	Spleen, bone marrow, liver.
Normal Values – RBC Count	**Male:** 4.5–6.5 million/mm^3 **Female:** 3.8–5.8 million/mm^3
Normal Values – Hemoglobin	**Male:** 13–18 g/100 ml **Female:** 11.5–16.5 g/100 ml
Erythropoiesis	Process of RBC formation from stem cells, takes ~7 days.
Nutrients Required	Vitamin B12 and Folic acid are essential for RBC synthesis.

☐ HEMOGLOBIN

Feature	Description
Structure	Large, complex protein made of globin (protein part) + heme (pigmented iron complex)
Composition	4 globin chains + 4 heme units (each with 1 iron atom)
Oxygen Binding	1 hemoglobin molecule carries 4 molecules of O_2
Pigment Conversion	When iron is removed → heme converts to biliverdin (green pigment)→ then to bilirubin (yellow-orange pigment)
Function	Transports O_2 in the body via RBCs

LEUKOCYTES (White Blood cells)

- **Life span** - 12 to 13 days.
- **Normal rang -** 4500 to 11000 cells/ul.



☐ NORMAL LEUKOCYTE COUNT

CELLS	NORMAL VALUE	PERCENTAGE
Neutrophil	2.5-7.5 × 109/l	40-75
Eosinophil	0.04-0.44 × 109/l	1-6
Basophil	0.015-0.1 × 109/l	<1
Monocytes	0.2-0.8 × 109/l	2-10
Lymphocytes	1.5-3.5 × 109/l	20-50

PLATELETS/THROMBOCYTES

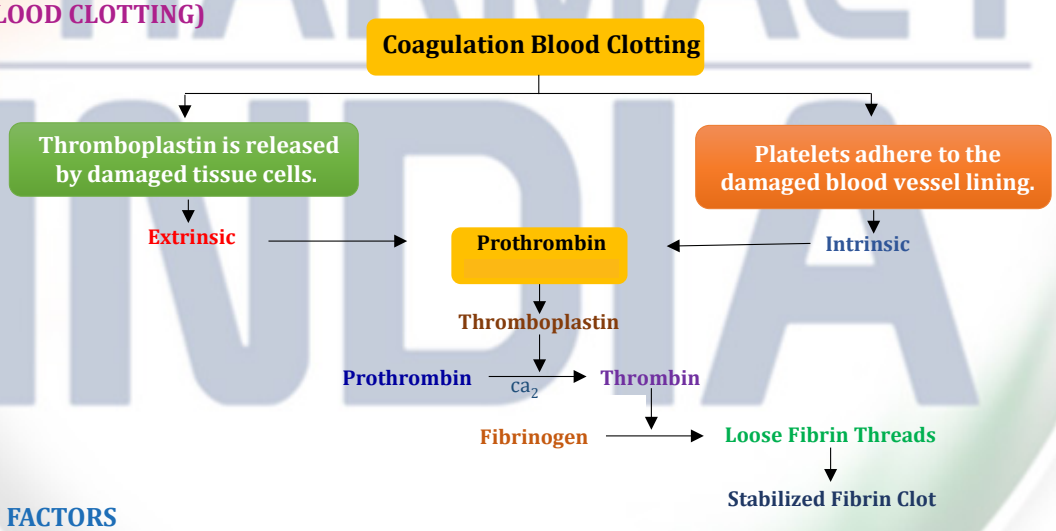
- Very small non-nucleated discs.
- 2 to 4 µm in diameter.
- Derived from the cytoplasm of megakaryocytes in red bone marrow.
- It contains a variety of substances that promote blood clotting, which causes haemostasis (cessation of bleeding). Normal blood platelet count → 200000 to 350000/ mm3.
- Thrombopoetin (Kidney) → stimulates platelet synthesis
- Life-span →7-10 days
- Thromboxanes is Synthesized by platelets.

HOMEOSTASIS

- Hemostasis → process of how the body stops bleeding from a cut or injury.
- This involves forming a clot to close the hole in the blood vessel and repairing the blood vessel.
- When a blood vessel is injured→ platelets stick together to form a plug.
- Homeostasis involves 3 steps-

Vasoconstriction → Platelet plug formation → Coagulation (Blood clotting)

COAGULATION (BLOOD CLOTTING)



BLOOD CLOTTING FACTORS

CLOTTING FACTOR NUMBER	CLOTTING FACTOR NAME	FUNCTION	PLASMA HALF -LIFE (HRS)
I	Fibrinogen	Clot formation	90
II	Prothrombin	Activation of I, V, VII, VIII, XI, XIII, protein C, platelets	65
III	Tissue factor (Thromboplastin)	Co-factor of VIIa	-
IV	Calcium ions	Faciliates coagulation factor binding to phospholipids	-
V	Proaccelerin, labile factor, or accelerator globulin(AcG).	Co-factor of X-prothrombinase complex	15

VII	Serum prothrombin conversion accelerator (SPCA), stable factor, or proconvertin.	Activates factor IX, X	5
VIII	Antihemophilic factor (AHF), antihemophilic factor A	Co-factor of IX-tenase complex	10
IX	Christmas factor, plasma thromboplastin component (PTC), or antihemophilic factor B.	Activates X: forms tenase complex with factor VIII	25
X	Stuart factor, Prower factor, or thrombokinase.	Prothrombinase complex with factor V; Activates factor II	40
XI	Plasma thromboplastin antecedent (PTA) or antihemophilic factor C.	Activates factor IX	45
XII	Hageman factor, glass factor, contact factor, or antihemophilic factor D.	Activates factor XI, VII and prekallikrein	-
XIII	Fibrin-stabilizing factor (FSF)	Crosslinks fibrin	200

BLOOD-RELATED DISORDERS

Disorder	Cause / Basis	Key Features
Anemia	Low hemoglobin or RBC count	Fatigue, pallor, weakness, shortness of breath
Sickle Cell Anemia	Genetic mutation in hemoglobin (HbS)	Sickle-shaped RBCs, pain crises, anemia, organ damage
Thalassemia	Genetic defect in globin chain synthesis	Severe anemia, bone deformities, growth retardation
Leukemia	Uncontrolled proliferation of WBCs	Anemia, infections, bleeding tendency, enlarged lymph nodes
Hemophilia	Deficiency of clotting factors (Factor VIII/IX)	Excessive bleeding, delayed clotting, joint bleeding
Polycythemia	Excessive RBC production	Increased blood viscosity, hypertension, risk of clots
Leukopenia	Decreased WBC count	Increased susceptibility to infections
Thrombocytopenia	Low platelet count	Easy bruising, petechiae, prolonged bleeding
Multiple Myeloma	Cancer of plasma cells (antibody-producing B-cells)	Bone pain, anemia, recurrent infections
Septicemia	Bacterial infection in blood	Fever, chills, rapid heart rate, life-threatening condition
Thrombocythemia	High Platelet Count	

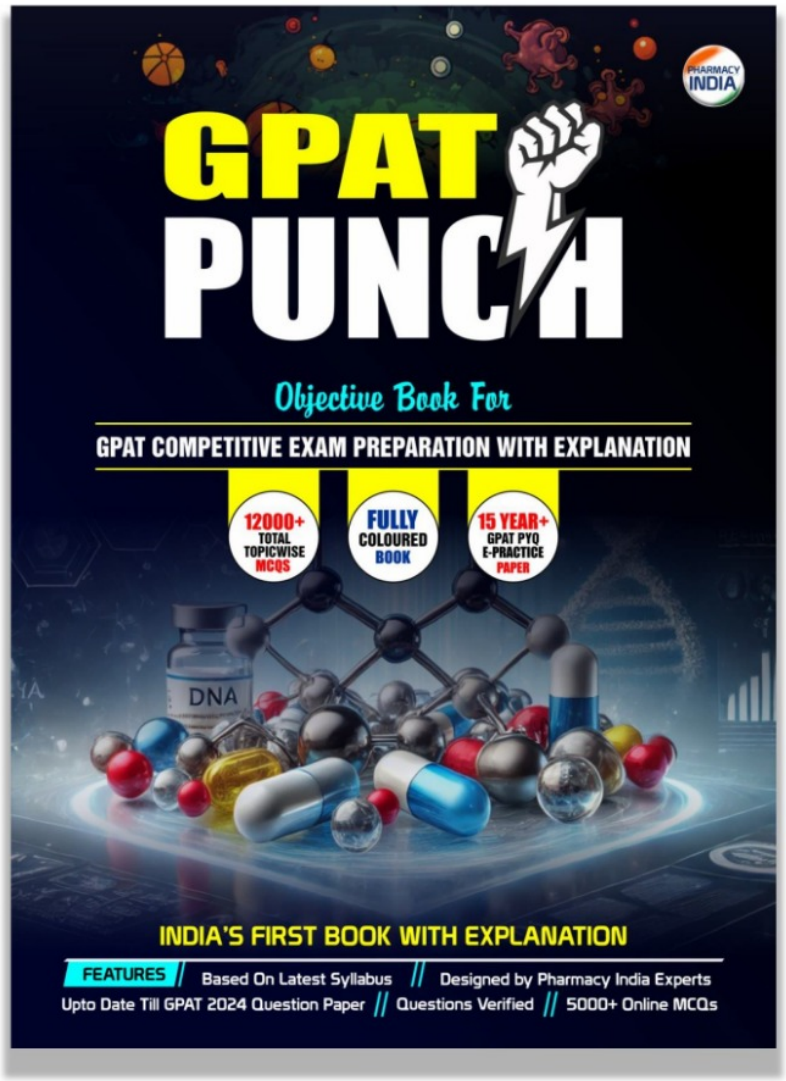
Blood Group System –

Blood Group	Antigen(s) on RBC	RBC (Can Donate To)	RBC Can Receive From
A^+	A ,Rh	A^+, AB^+	A^+, A^-, O^+, O^-
A^-	A	A^+, A^-, AB^+, AB^-	A^-, O^-
B^+	B ,Rh	B^+, AB^+, AB^-	B^+, B^-, O^+, O^-
B^-	B	B^+, B^-, AB^+, AB^-	B^-, O^-
AB^+	A, B, Rh	AB^+ only	All groups (Universal Recipient)
AB^-	A, B	AB^+, AB^-	A^-, B^-, AB^-, O^-
O^+	Rh(D)only	All Rh^+ groups	O^+, O^-
O^-	None	All groups (Universal RBC Donor)	O^- only

TRICKS TO REMEMBER

- **RBC Rule:** "O gives to all, AB takes from all."
- **Plasma Rule:** Reverse – "AB plasma gives to all, O plasma takes from all."
- Antibodies are always opposite to antigens.
- **Rh Rule:** Negative never accepts Positive; Positive accepts both.
- **Bombay (Oh):** No H antigen → looks like O but can only receive from Bombay type.

BEST BOOK FOR GPAT PREPATRATION



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