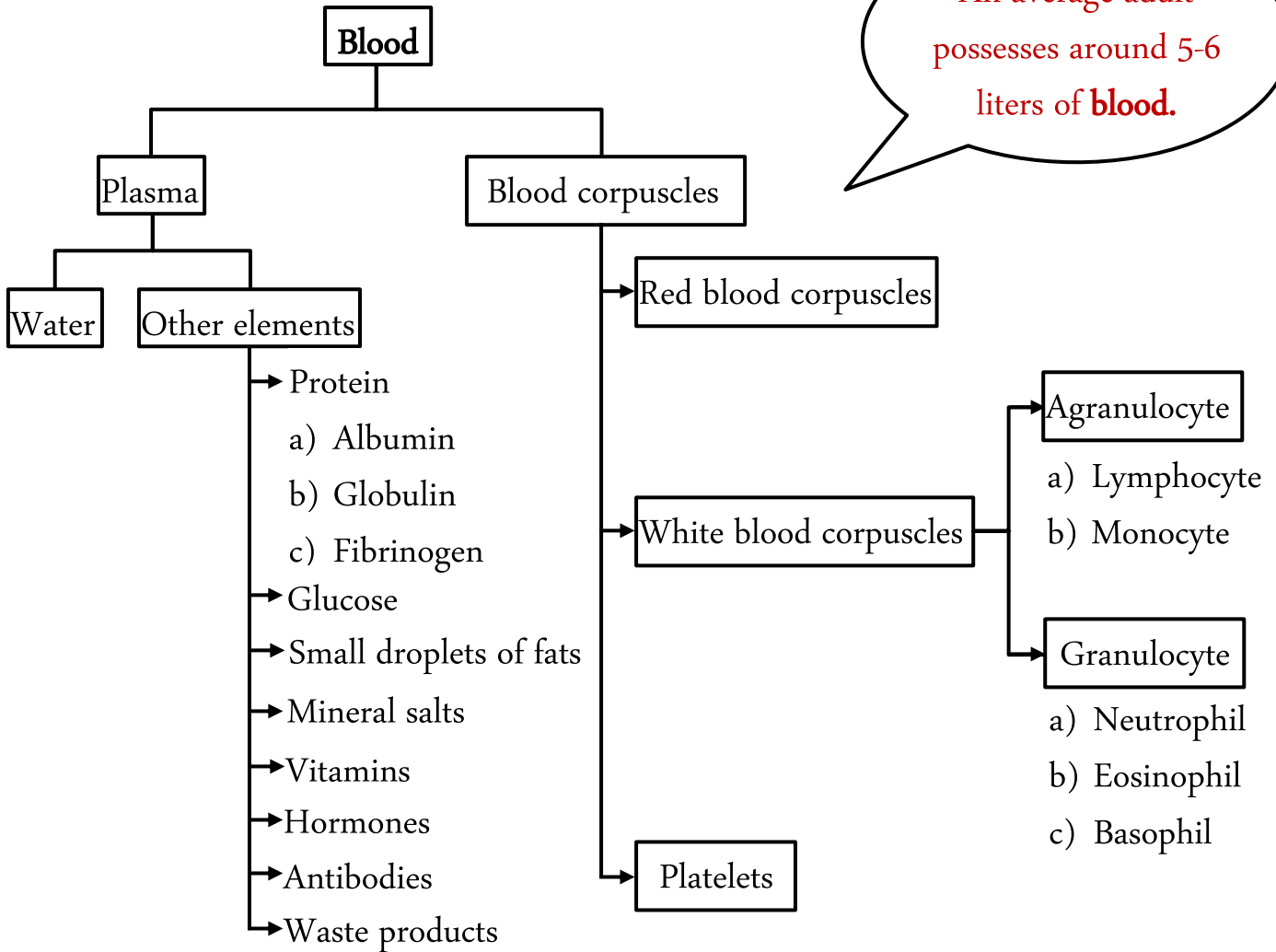


Name of the student: Date: 06/10/2020

Blood:

Blood is a viscous, slightly alkaline and salty fluid.

An average adult possesses around 5-6 liters of **blood**.

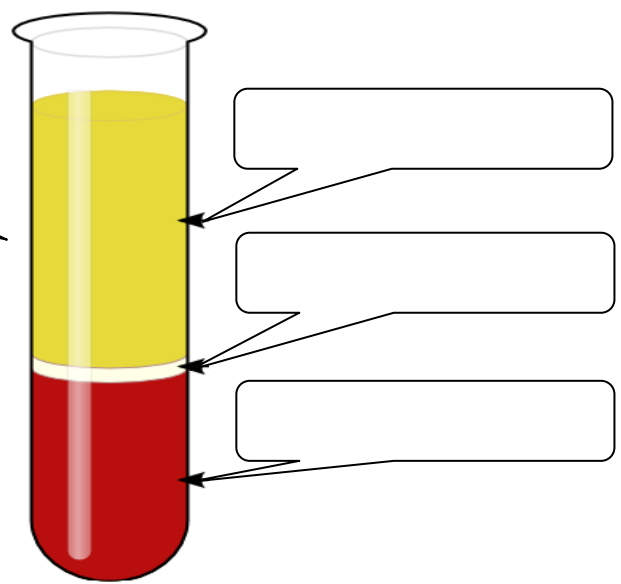


1) Plasma

Blood plasma is a yellowish liquid component of **blood** that holds the **blood** cells of whole **blood** in suspension.

Q. Write the name of the components of blood.

Blood plasma without fibrinogens (clotting factors) is called **serum**.



About 55% of our **blood** is **plasma**, and the remaining 45% are **blood** corpuscles (free floating or suspended small cells).

- Plasma carries nutrients, hormones, and proteins to the different parts of the body.
- It carries away the waste products of cell metabolism from various tissues to the organs responsible for detoxifying and/or excreting them.
- Plasma proteins keep the blood pH slightly alkaline by binding excess hydrogen ions in the blood.
- Plasma proteins can also supply amino acids if required by being broken down by macrophages.
- In addition, plasma is the vehicle for the transport of the blood cells through the blood vessels.

Q. Why is plasma considered as most important component of blood?

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Blood cells or corpuscles:

All of the cells found in the blood come from bone marrow. They begin their life as stem cells, and they mature into three main types of cells—

1. **Red blood cells (Erythrocytes)**
2. **White blood cells (Leukocytes)**
3. **Platelets (Thrombocytes)**

1. Red blood cells (Erythrocytes)

- ✓ RBCs are the biconcave cells and without nucleus in humans; also known as erythrocytes.
- ✓ RBCs contain the iron-rich protein called haemoglobin; give blood its red color.
- ✓ RBCs are the most copious blood cell produced in bone marrows.
- ✓ The average viability of RBCs is 120 days.
- ✓ The main function of RBCs is to transport oxygen and carbon dioxide.

● Lungs (Haemoglobin + O₂ = Oxyhaemoglobin) → Heart → Different organs (Oxyhaemoglobin = O₂ + Haemoglobin)

● Organs ((Haemoglobin + CO₂ = Carbaminohaemoglobin) → Heart → Lungs (Carbaminohaemoglobin = CO₂ + Haemoglobin)

● CO₂ diffuses into RBC; $\text{CO}_2 \xrightarrow{\text{Carbonic anhydrase (CA) of RBC}} \text{H}_2\text{CO}_3 \rightarrow \text{HCO}_3^- + \text{H}^+$

➤ A buffer system is a solution that resists a change in pH when acids or bases are added to it.

➤ Carbonic anhydrase is an enzyme that assists rapid inter-conversion of carbon dioxide and water into carbonic acid, protons and bicarbonate ions.

Q. Why is the blood of grasshopper colorless?

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Q. How does RBC helps in transportation of O₂ & CO₂?

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2. White blood cells (Leucocytes)

- ✓ Leucocytes are the colorless blood cells.
- ✓ They are colorless because it is devoid of haemoglobin.
- ✓ They are produced in bone marrow and lymphatic glands.
- ✓ The average viability of WBCs is 1-15 days.
- ✓ produced in bone marrows.
- ✓ The average viability of RBCs is 120 days.
- ✓ WBCs mainly contribute to immunity and defense mechanism.

They are classified as agranulocytes and granulocytes.

a) Agranulocytes

They are leukocytes, with the absence of granules in their cytoplasm. **Agranulocytes are further classified into monocytes and lymphocytes.**

1) Lymphocytes

- They play a vital role in producing antibodies.
- Their size ranges from 8 to 10 micrometres.
- They are commonly known as natural killer cells.
- They play an important role in body defense.
- These white blood cells are colourless cells formed in lymphoid tissue, hence referred to as lymphocytes.
- There are two main types of lymphocytes—**B lymphocytes and T lymphocytes.**
- These cells are very important in the immune systems and are responsible for humoral and cell-mediated immunity.

Humoral- relating to the body fluids, especially with regard to immune responses involving antibodies in body fluids as distinct from cells.

2) Monocytes

- These cells usually have a large bi-lobed nucleus, with a diameter of 12 to 20 micrometres.
- The nucleus is generally of half-moon shaped or kidney-shaped and it occupies 6 to 8 per cent of WBCs. These white blood cells have a single bean-shaped nucleus, hence referred to as Monocytes.

- They are the garbage trucks of the immune system.
- The most important functions of monocytes are to migrate into tissues and clean up dead cells, protect against the blood-borne pathogens and they move very quickly to the sites of infections in the tissues.

Q. Write down three differences between lymphocyte and monocyte.

Lymphocyte	Monocyte

b) Granulocytes

They are leukocytes, with the presence of granules in their cytoplasm. The granulated cells include- eosinophil, basophil, and neutrophil.

1) Eosinophils

- They are the cells of leukocytes, which are present in the immune system.
- These cells are responsible for combating infections in parasites of vertebrates and for controlling mechanisms associated with the allergy and asthma.
- Eosinophil cells are small granulocyte, which is produced in the bone marrow and makes 2 to 3 per cent of whole WBCs. These cells are present in high concentrations in the digestive tract.

2) Basophils

- They are the least common of the granulocytes, ranging from 0.5 to 1 per cent of WBCs.
- They contain large cytoplasmic granules, which plays a vital role in mounting a non-specific immune response to pathogens, allergic reactions by releasing histamine and dilates (expands) the blood vessels.

- These white blood cells have the ability to be stained when exposed to basic dyes, hence referred to as basophil.
- These cells are best known for their role in asthma and their result in the inflammation and bronchoconstriction in the airways.
- They secrete serotonin, histamine and heparin (an anticoagulant (blood thinner) that prevents the formation of blood clots inside blood vessels).

3) Neutrophils

- They are normally found in the bloodstream.
- They are predominant (major) cells, which are present in pus.
- Around 60 to 65 per cent of WBCs are neutrophils with a diameter of 10 to 12 micrometres.
- The nucleus is 2 to 5 lobed and cytoplasm has very fine granules.
- Neutrophil helps in the destruction of bacteria with lysosomes, and it acts as a strong oxidant.
- Neutrophils are stained only using neutral dyes. Hence, they are called so.
- Neutrophils are also the first cells of the immune system to respond to an invader such as a bacteria or a virus.
- The lifespan of these WBCs extend for up to eight hours and are produced every day in the bone marrow.

Q. Write down three comparisons among eosinophil, basophil and neutrophil.

Eosinophil	Basophil	Neutrophil

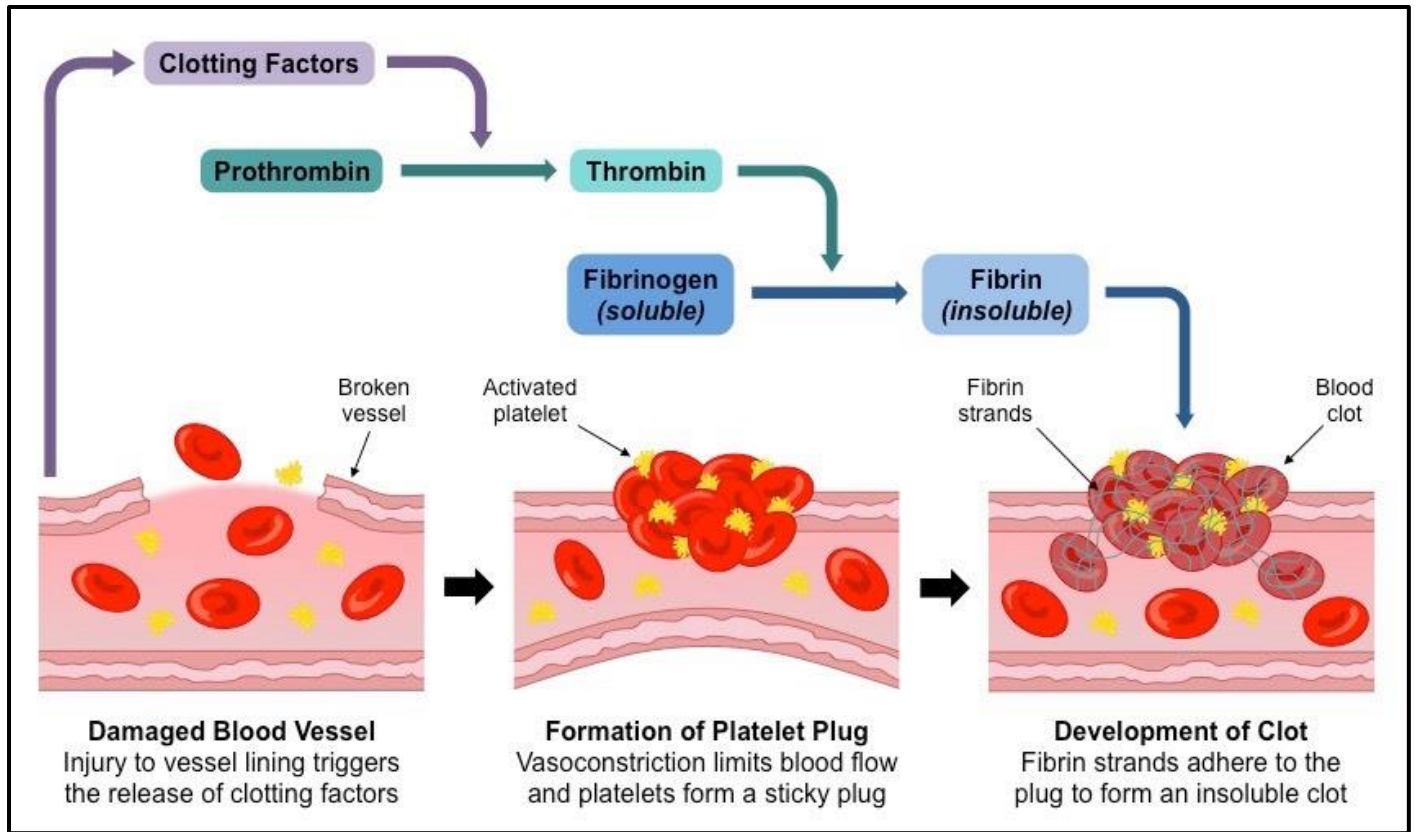
3. Platelets (Thrombocytes)

- Platelets are small in size, colorless, spindle shaped and non-nucleated.
- Thrombocytes are specialized blood cells produced from bone marrow.
- Platelets come into play when there is bleeding or haemorrhage.
- Their average viability is 5-10 days.
- They help in clotting and coagulation of blood. Platelets help in coagulation during a cut or wound.

Q. Write down five comparisons among RBC, WBC and platelets.

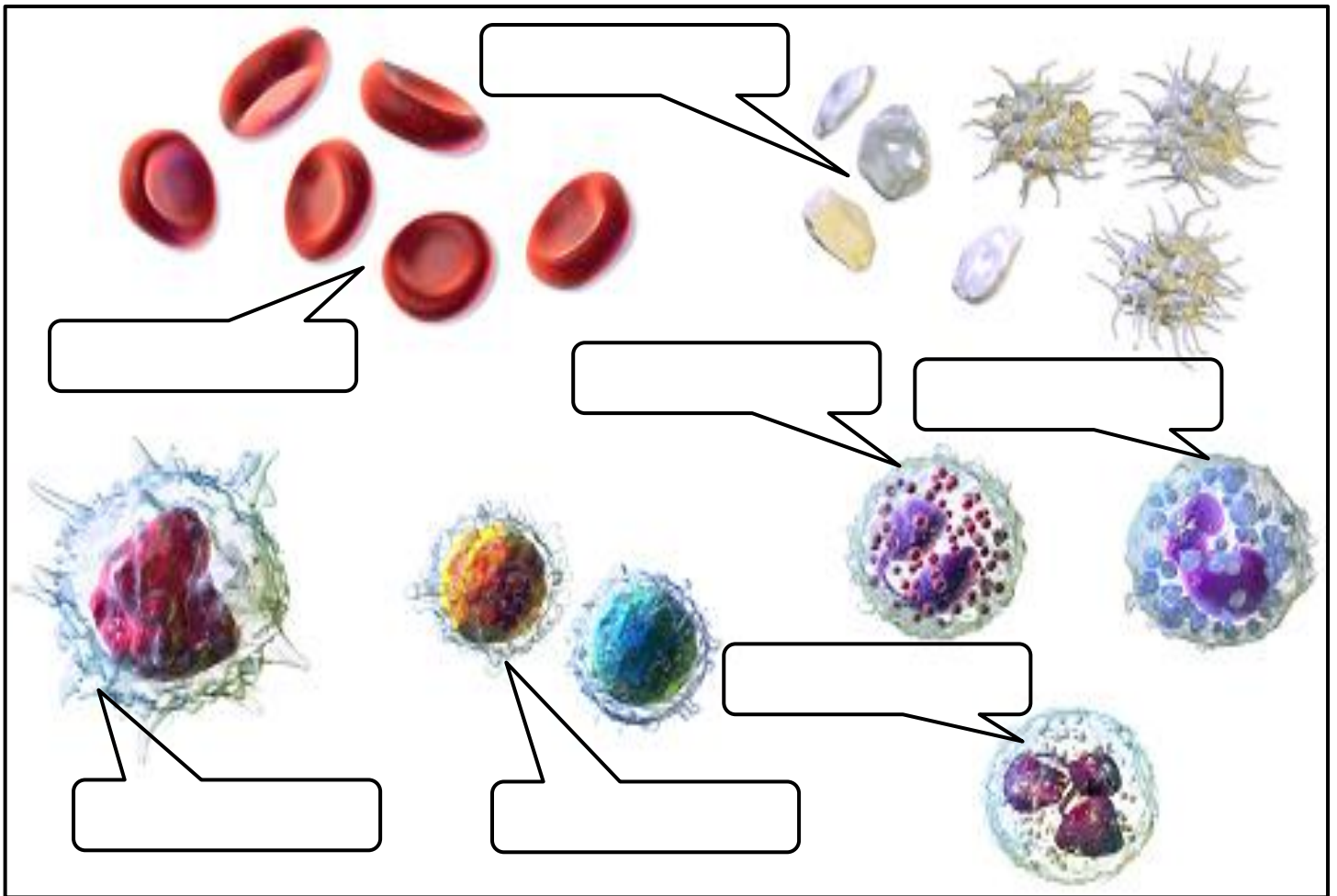
RBC	WBC	Platelets

Coagulation or clotting of blood:



Q. How does thrombocyte helps in coagulation of blood when the endothelial surface of blood vessels is injured?

Q. Identify the following blood corpuscles.



SK