Blood consists of plasma and formed elements. The plasma is the fluid portion of the blood and consists of water, proteins and dissolved materials such as oxygen, carbon dioxide, electrolytes and other materials. Plasma makes up about 55% of the blood volume. Formed elements make up about 45% of the blood volume and consist of **erythrocytes** (red blood cells, a), **leukocytes** (white blood cells, c) and **thrombocytes** (platelets, b). Label and color the RBC’s red, the WBC’s light blue and color the nucleus violet. Label and color the thrombocytes blue.

**Thrombocytes** are involved in blood clotting. Note the size of the thrombocyte compared to the other cells.

**Erythrocytes** do not have a nucleus and they appear like a donut with a thin spot instead of a donut hole. About a third of the weight of a RBC is due to hemoglobin, which is made of iron and is what makes the cells red. Color the surface view and cross section of the RBC.

There are two main types of leukocytes: **granular leukocytes** and **agranular leukocytes**.

The granular leukocytes have cytoplasmic granules that either stain pink or dark purple or do not stain much at all. The granular leukocytes that do not stain much at all are called **neutrophils** because the granules are neutral to the stains. Neutrophils have a three to five-lobed nucleus. Color the cells by shading the cytoplasm blue and coloring the nucleus violet.

The **eosinophils** are granular leukocytes that have pink or orange staining granules. The nucleus is generally two-lobed. Color the nucleus violet, the granules orange and the cytoplasm light blue.

**Basophils** are a rare granular leukocyte in that they make up less than 1% of all WBCs. The nucleus is S shaped. Label the basophil and color the granules violet and the cytoplasm light blue.

The two kinds of agranular leukocytes are **lymphocytes** and the **monocytes**. The lymphocytes can be large or small and make up 20-30% of the leukocytes. The cytoplasm is light blue and the nucleus is violet. The nucleus of the lymphocyte is dented or flattened. Lymphocytes come in two kinds **B cells** secrete (antibody mediated immunity) and **T cells** are involved in cell mediated immunity. Label and color the lymphocytes.

The **monocytes** are large cells (about three times the size of a red blood cell) and have a strongly lobed nucleus. Label the monocyte, color the nucleus violet and the cytoplasm light blue.
The Blood:

In the test tube:
Color the White blood cells light blue
Color the Red Blood Cells red.
Color the Thrombocytes blue.
Color the Plasma yellow.

What is the role of Platelets? ________________________________

What are sickle cells? ________________________________

Use the terms to fill in the blanks:

<table>
<thead>
<tr>
<th>Plasma</th>
<th>Platelets</th>
<th>Lymphocytes</th>
<th>Antigens</th>
<th>Fibrin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hemoglobin</td>
<td>Antibodies</td>
<td>Anemia</td>
<td>Leukemia</td>
<td></td>
</tr>
</tbody>
</table>

Lymphatic system

____________________1. Iron containing molecule in red blood cells
____________________2. White blood cells which produce antibodies
____________________3. Liquid part of the blood
____________________4. Returns tissue fluid to the blood
____________________5. Cell fragments involved in clotting
____________________6. Foreign molecules in the body
____________________7. Cancer of the bone marrow
____________________8. Condition in which the blood cannot carry sufficient oxygen
____________________9. Strands of protein involved in clotting
____________________10. React with antigens and inactivates them
### Blood Types and Transfusions:

<table>
<thead>
<tr>
<th>Blood Type</th>
<th>Draw a picture of the RBC with Antigens (if any)</th>
<th>Draw a picture of the Antibodies in this blood type (if any)</th>
<th>This blood type may donate to:</th>
<th>This blood type may receive from:</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td><img src="image" alt="A RBC" /></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td><img src="image" alt="B RBC" /></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AB</td>
<td><img src="image" alt="AB RBC" /></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>O</td>
<td><img src="image" alt="O RBC" /></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Why are individuals with type O blood considered the universal donor? Be specific—use the word antigen:

Why are individuals with blood type AB considered universal recipients? Be specific—use the word antibody: