Introduction
Blood is a tissue, a group of similar cells working together to perform a function. There are three main types of cells that make up the solid part of blood: red blood cells, white blood cells, and platelets. Each of these types of cells has a specific function. Red blood cells transport oxygen to the rest of the body; white blood cells aid in the body’s ability to fight infection; and platelets help the body heal itself by forming scabs. In a normal, healthy person, the number of each type of cell is relatively constant. However, when people are sick with certain diseases, the number of the different types of cells can change. If a doctor examines a patient’s blood and counts the number of each type of cell, he or she may be able to diagnose the patient’s disease.

Objective:
Upon completion of this lab, the student will know the general function of each blood cell type, their relative abundance in the blood, and how to recognize each type. In addition, the student will be able to identify five disease based on their blood characteristics.

The Solid Part of Blood:
Before starting the lab, use your notes to write out the functions of each of the three solid parts (blood cells) of blood.

Platelet – ____________________________________________________________
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________

Red Blood Cells – ______________________________________________________
_____________________________________________________________________
_____________________________________________________________________

White Blood Cells - ____________________________________________________
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________

_____________________________________________________________________
_____________________________________________________________________

_____________________________________________________________________

_____________________________________________________________________
Procedure:

Part 1 - Normal Blood Sample
1. Examine Figure 1. This figure shows a sample of normal human blood, magnified 1,000 times.

   ![FIGURE 1. Normal blood sample](image)

2. Count the number of each type of cell present. Mint: To avoid counting twice, place a check on each cell as you count.
   - **Red blood cells** – round, very numerous, no nucleus
   - **White blood cells** – round, few in number, nucleus present, large
   - **Platelets** – dot-like, numerous, (less than red blood cell), very small

3. Record the number of each type of blood cell in the data table located on page 4 of this lab.

4. Using the numbers 1, 2, and 3, rank the type of blood cells in the order from the most common (1) to the least common (3). Enter these rankings in the column Marked “ Ranked” on the data table.

Part 2 - Blood Cells from Diseased Individuals
1. Examine Figures # 2-6. These are samples of blood from people with different diseases.

2. Count the number of red blood cells, white blood cells, and platelets. Record the number of each type of cell in the correct column for each figure on the data table.

3. Rank the types of blood cells in order from most common (1) to the least common (3). Enter these rankings in the appropriate column on the data table.
# Part III – Diagnosing Blood Diseases

1. Reading the case histories of five hospital patients below.

2. Match each case history with one of the patients whose blood sample you have already examined. Write the number of the figure of their blood sample in the appropriate space.

3. Write the name of the disease diagnosed on the bottom row of the data table based on the above table.

<table>
<thead>
<tr>
<th>PATIENT</th>
<th>CASE HISTORY</th>
<th>BLOOD ANALYSIS</th>
<th>DISEASE DIAGNOSIS</th>
<th>FIGURE # from Abnormal Blood Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male, white, age 28</td>
<td>Has admitted to injecting drugs for the past 6 years, has pneumonia and skin cancer</td>
<td>Few white blood cells present</td>
<td>AIDS (Acquired Immune Deficiency Syndrome)</td>
<td></td>
</tr>
<tr>
<td>Male, black, age 15</td>
<td>Always tired, shortness of breath</td>
<td>Red blood cells shaped like crescent moon</td>
<td>Sickle cell anemia</td>
<td></td>
</tr>
<tr>
<td>Female, oriental, age 14</td>
<td>Has fever, sore throat, and frequent nose bleeds</td>
<td>Few red blood cells, many white blood cells, blood cell ranking: (1) white, (2) red, (3) platelets</td>
<td>Leukemia</td>
<td></td>
</tr>
<tr>
<td>Male, white, age 68</td>
<td>Has frequent headaches and nose bleeds, high blood pressure, very red complexion</td>
<td>Very many red blood cells</td>
<td>Polycythemia</td>
<td></td>
</tr>
<tr>
<td>Female, white, age 22</td>
<td>Has sudden appearance of purple marks under skin, bruises easily, does not clot after being cut.</td>
<td>Very few platelets, blood cell ranking: (1) red, (2) white, (3) platelets</td>
<td>Thrombocytopenia</td>
<td></td>
</tr>
</tbody>
</table>
Questions:

1) In normal blood, what is the ratio (reduce to the simplest ratio) of red blood cells to white blood cells? In other words, how many red blood cells for every 1 white blood cell? (# of red blood cells divided by # of white blood cells) 

2) Explain why a person with AIDS is also likely to die from pneumonia or other diseases that would not ordinarily kill a healthy person. Hint: Think about the main function of white blood cells.

3) The ranking of blood cells in a person with polycythemia is the same as a healthy individual. Explain how you can conclude that a person has polycythemia.

4) Identify the blood disease described.
   a. Too many white blood cells -
   b. Too few platelets -
   c. Too few properly functioning red blood cells -
   d. Too many red blood cells -
   e. Too few white blood cells -

5) Why do people with thrombocytopenia purpura have many bruises?

6) Red blood cells, white blood cells and platelets make up the solid part of blood. What is the liquid part of blood called?
Abnormal Blood Samples

Figure 2.

Figure 3.

Figure 4.

Figure 5.

Figure 6.