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Name Number

LAB: Human Blood Components

Human blood – always red in color when the cells are functional – has a volume of about five liters in a typical human adult. A gallon of liquid – blood, water, etc. is about four liters. So the typical human has a bit over a gallon of blood circulating in their body. Remember this when you have a cut… you are really not going to die from bleeding out… When a person donates blood, the donation is about one-half a liter known as a pint.

The four parts of blood are the liquid, slightly yellowish liquid called *p\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_*, the red-blood cells called *e\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_* that carry oxygen, the white-blood cells called *l\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_* that help recognize and fight disease, and cell *fragments* known as *p\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_* that create blood *clots* or scabbing.

In this lab, we will use a microscope to examine a blood sample. The samples have been fixed and preserved. They are safe. Actually, they were prepared by a physician. She studies blood – its production (in *bone marrow*), function (transporting oxygen, carbon dioxide, nutrients, waste, fighting disease, etc.), and diseases (such as sickle-cell *anemia* and *leukemia*). Scientists that study blood are called *h\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_*. *Be sure and follow my directions so that the slides will not be mishandled or damaged, and the microscope is not damaged either.*

Touch the blood slides ONLY on the edges of the slide. Turn the *nosepiece* of your microscope so that the 4x *objective lens* is in place. It will make a clicking sound when it is properly placed. Place your slide on the *microscope stage*, and if you microscope has *stage clips*, place the slide under the stage clips. Turn the microscope *lamp* on. Using the *coarse adjustment dial*, focus the slide image under 4x. Actually, the total power of the microscope is 40x. The *eyepiece lens* or *ocular lens* is 10x. To obtain the total power of the microscope, one multiplies the objective lens strength and the ocular lens strength. When you are looking through the eyepiece, the round illuminated area is called the *field of view*. Notice the cells. Most are circular and red. Much clumping has occurred. The red cells are *erythrocytes* (“*cyte*” means cell). They carry *oxygen (O2)* from the lungs to the other cells in your body. Additionally, they bring *carbon dioxide (CO2)* from your cells to the *lungs*. Oxygen is used by your body to break down *sugars* (in the *mitochondria*) releasing *energy*. The carbon dioxide is the waste product of this process called *respiration*. Human blood is always red. Bright red when it is oxygenated, and dull red when it holds carbon dioxide.

Now, switch the objective lens to 10x (or total 100x power) by carefully turning the nosepiece of the microscope listening for the click when the objective lens is properly positioned. Never use the coarse adjustment to focus the microscope when using the 10x or 40x objective lenses. Always use the smaller (assuming your microscope has one) *fine focus adjustment knob* when using the higher power objective lenses. Notice more detail is visible. The lumps and clumps of cells become visible. Small purple blue fragments called platelets are visible, and occasionally there will be larger blue-staining leukocytes visible.

Carefully switch to the highest power objective lens. Carefully focus the microscope using the fine focus adjustment knob. What is the total magnification of your microscope? \_\_\_\_\_\_\_\_\_x. Notice that you see greater detail, but the field of view is diminished (a lesser number of cells is visible). Also, the amount of light available might have changed. If your microscope has a *diaphram*, you might need to adjust the intensity of light.

Switch back to medium power – 10x objective – with a total magnification of \_\_\_\_\_\_\_\_\_\_x.

Examine the slide. Pick a spot on the slide with “cells” all around. Study the slide. Be sure that erythrocytes, leukocytes, and the cell fragments know as platelets are visible. Clearly, erythrocytes are greatest in number.

Draw neatly and completely an example of each. Show as much detail as you are able to see, and draw them in to the proper size. The erythrocyte should take up half the box! Judge from there.

Erythrocyte Leukocyte Platelet

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Erythrocytes do not have a *nucleus*, leukocytes do have a nucleus, and platelets are cell fragments. Erythrocytes contain *hemoglobin*. A lot of hemoglobin! Hemoglobin looks like a four-leaf clover with an atom of iron in the center. When oxygen is attached to the hemoglobin, the iron rusts a bright red. When carbon dioxide is attached, hemoglobin is a dull red. Sketch a molecule of hemoglobin and place the iron (symbol Fe) in the center.

The four loops are *peptides or polypeptides*, and the four loops together are called a *protein*. Proteins (peptides and polypeptides) are made of chemical bricks or *monomers* called *amino acids*. Peptides, polypeptides, and proteins are *polymers* made, manufactured or *synthesized* in cell *organelles* called *ribosomes*. If the protein is misshapen, then the ability of hemoglobin molecule will change and oxygen (O2) capacity will be diminished resulting in anemia!

Lastly, under medium power, count the number of cells (careful, I have done this, so I know the approximate value you should obtain!). The easiest way to do this is to imagine the field of view as to be divided into four quarters. Pick a quarter of the field of view, and count the number of each type of “cell” in the quarter (1st column), then multiply by four to get the total in the field of view (2nd column). When diagnosing disease such as leukemia, a physician examines the ratio between the number of each cell type, to give them clues as to their diagnosis. There is a lot to learn about life. Using a microscope and your thinking skills can lead to extraordinary insights. Enjoy learning!

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| # of cells in a quarter field of view | Total number of cells in the field of view | Ratio of the cell type number. Divide the smallest number of “cell” type into each total for the field of view. Obviously, one of the numbers should be one… |
| Erythrocytes |  |  |
| Platelets |  |  |
| Leukocytes |  |  |
| xxxxxxxxxxxxxxxxxxxxxxxxxxx | xxxxxxxxxxxxxxxxxxxxxxxxxx | xxxxxxxxxxxxxxxxxxxxxxxxxxx |

Please, return the slides to their holder (touching the slides along their edges only). Turn off the scope, and click the low power objective lens into place. Center the microscope in the middle of the table.

Together, let’s sketch and label the parts of a compound light microscope below.