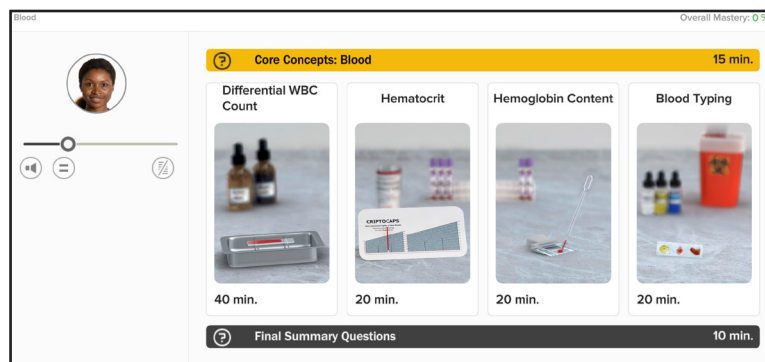




General Lab Outline

- I. Core Concepts
- II. Differential White Blood Cell Count Exercise
- III. Hematocrit Exercise
- IV. Hemoglobin Content Exercise
- V. Blood Typing Exercise
- VI. Final Summary Questions



Assessed Learning Outcomes

Core Concepts

- A. Recall that blood is composed of plasma and the formed elements
- B. Structure and function of the formed elements
 1. Recall the structure and function of red blood cells
 2. Recall the structure and function of white blood cells
 3. Recall the structure and function of platelets
 4. Compare the structure and function of the formed elements
- C. Understand the basis of blood typing
 1. Recall the red blood cells are covered in antigens, and plasma contains antibodies for foreign antigens
 2. Match blood types and antibodies
 3. Explain when transfusion reactions occur
- D. Recall how to safely handle human blood

Blood Smear and Differential White Cell Count Exercise

- A. Pre-lab Briefing
 1. Recall the steps to perform a blood smear
 2. Recall how to perform a differential white blood cell count
- B. Identify different white blood cells
 1. Identify platelets in a blood smear slide
 2. Identify erythrocytes in a blood smear slide
 3. Identify neutrophils in a blood smear slide

4. Identify lymphocytes in a blood smear slide
5. Identify monocytes in a blood smear slide
6. Identify eosinophils in a blood smear slide
7. Identify basophils in a blood smear slide
- C. Simulator: Blood Smear and Differential White Cell Count
 1. Prepare a blood smear
 - a. Add a drop of blood
 - b. Smear the blood drop
 - c. Let blood smear dry in the air
 2. Stain the blood smear
 - a. Add Wright's stain to blood smear
 - b. Let Wright's stain react for a suitable time
 - c. Add distilled water to the slide with stain
 - d. Let the stain and water mixture react for a suitable time
 - e. Rinse the stained blood smear
 - f. Let the slide air dry
 3. Perform the correct procedure without guidance
 4. Dispose of materials contaminated with blood in biohazard container
 5. Perform a different count on prepared microscope slide
 6. Differential cell count
 - a. Count the correct number of neutrophils
 - b. Count the correct number of lymphocytes
 - c. Count the correct number of monocytes
 - d. Count the correct number of eosinophils
 - e. Count the correct number of basophils
 7. Infer the patient's health problem from the results of the differential white cell count
- D. Post-lab Questions
 1. Explain the outcome if the stain acts for the wrong time
 2. Identify the normal values of a differentials white blood cell count
 3. Know the relationship between an abnormal differential white cell count and likely diseases

Hematocrit Exercise

- A. Pre-lab Briefing
 1. Recall how to prepare a blood sample for a hematocrit test
- B. Simulator: Hematocrit
 1. Fill a capillary tube with blood
 2. Seal capillary tubes
 3. Separate blood and plasma in the centrifuge
 4. Measure the hematocrit for one blood sample
 5. Test all the 5 blood samples
 6. Balance centrifuge
 7. Recall how to place the capillary tubes in centrifuge
 8. Infer whether test results indicate doping
 9. Use safe blood handing practices
 10. Avoid cross-contamination samples
- C. Post-lab Questions
 1. Explain the purpose of a hematocrit test
 2. Recall the normal hematocrit levels

Hemoglobin Content Exercise

- A. Pre-lab Briefing
 - 1. Recall how to prepare a blood sample for a hemoglobin test
- B. Simulator: Hemoglobin Test
 - 1. Test the three blood samples and positive and negative controls
 - 2. Stir until all hemoglobin is out of the red blood cells
 - 3. Measure the hemoglobin content
 - 4. Use safe blood handling practices
 - 5. Avoid cross-contaminating samples
 - 6. Recall why hemolysis applicators are used
 - 7. Infer whether test results indicate doping
- C. Post-Lab Questions
 - 1. Explain the purpose of a hemoglobin test
 - 2. Recall the normal hemoglobin content

Blood Typing Test

- A. Pre-lab Briefing
 - 1. Recall how to determine the blood type
 - 2. Recall which transfusions lead to transfusion reactions
- B. Simulator: Blood Typing
 - 1. Test all blood samples
 - 2. Label the test slides
 - 3. Recall how the slides should be labeled
 - 4. Add blood from only one patient to each slide
 - 5. Add the test serum to the labeled spot on the slide
 - 6. Determine the blood type
 - 7. Use safe blood handling practices
 - 8. Avoid cross-contaminating blood samples
 - 9. Recall why toothpicks are used in this experiment
 - 10. Use your results to determine who can donate blood to whom
- C. Post-lab Questions
 - 1. Realize the need for type O packed cell transfusion when donor and recipient do not exactly match

Final Summary Questions

- A. Differentiate between the purposes of the various blood tests

Student Instructions for Simulators

Differential WBC Count:

Task: Prepare a blood smear and perform a differential white blood cell count. Use the results to draw conclusions about a patient's illness.

Follow these steps to make the blood smear.

- Add a blood drop to the slide.
- Use another glass slide to smear the blood drop and let it air dry for 1 minute.
- Add a few drops of Wright's stain to the smear and let it rest for at least 2 minutes.
- Use the dropper to add an equal amount of distilled water to the smear and let it rest for 4 minutes.
- Wash the slide with filtered water and let it air dry for 1 minute.
- Look at your smear in the microscope.

Follow these steps to conduct a differential white blood cell count.

- Start by focusing the microscope at high magnification.
- Move around the slide, marking each different type of white blood cell you observe until you have observed at least 50 white blood cells.
- Enter your information into the lab notebook.

Hematocrit:

Task: You have gotten blood samples from three athletes. Determine the hematocrit of the blood samples and use your results to determine whether the athletes have used blood doping.

Follow these steps.

- Fill a capillary with blood.
- Clean the capillary with a wipe and seal it with clay on one end.
- Place the capillary in the centrifuge and prepare the other capillaries.
- Spin the capillaries in the centrifuge for about 4 minutes to separate the blood cells from the plasma.
- Measure the percent volume of blood cells using the hematocrit chart.
- Record your measurements in the lab notebook.
- Based on the positive and negative reference samples, determine whether the tests samples are likely to be doped.

Hemoglobin Content:

Task: You have gotten blood samples from three athletes. Determine the hemoglobin content of the blood samples and use your results to determine whether the athletes have used blood doping.

Follow these steps.

- Place a drop of blood in the blood chamber of the hemoglobinometer.
- Use the hemolysis applicator to spread and break down the red blood cell membranes and allow the hemoglobin to go into a uniform solution. Keep smearing until the blood is a lighter color.
- Add the glass cover to the blood chamber and move it to the hemoglobinometer.
- Measure the hemoglobin content by adjusting the slider the match the light intensity in the viewfinder of the hemoglobinometer.
- Record your measurements in the lab notebook.
- Based on the positive and negative reference samples, determine whether the tests samples are likely to be doped.

Blood Typing:

Task: Determine the blood type of three patient samples. Based on the results, determine who can donate blood to each other.

Follow these steps.

- Take a microscope slide and label it correctly.
- Add a drop of blood and a drop of serum according to the labeled spots in the slide.
- Mix the blood and serum and wait a couple of minutes for a reaction.
- Use the chart to determine the blood type.
- Use your results to determine which patient can donate to whom.