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| **Lesson Title : Optimizing Organ Donation** | **Unit #:**  **1** | **Lesson #:**  **2** | **Activity #:**  **4** |
| **Activity Title: Blood and Protein Typing** |

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| **Estimated Lesson Duration:** | **6 days** |
| **Estimated Activity Duration:** | **2 days** |

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| **Setting:** | **Rm 2610, Scott High School** |

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| **Activity Objectives:** |

Students will be able to:

1. Identify the different types of blood,
2. explain why blood has a type based on the cell identifiers,
3. demonstrate blood typing in a lab setting,
4. discuss how blood typing can be used to identify a suspect in a murder case, and
5. construct an argument to justify why the suspect is guilty.

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| **Activity Guiding Questions:** |

* What are the different types of blood?
* Why is blood type important?
* What types of blood “match”?
* What parts of the cell identify the blood type?
* Who discovered blood typing?
* How was blood typing discovered?
* Why is it important to know blood type?

| **Next Generation Science Standards (NGSS)** | |
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| **Science and Engineering Practices (Check all that apply)** | **Crosscutting Concepts (Check all that apply)** |
| Asking questions (for science) and defining problems (for engineering) | Patterns |
| Developing and using models | Cause and effect |
| Planning and carrying out investigations | Scale, proportion, and quantity |
| Analyzing and interpreting data | Systems and system models |
| Using mathematics and computational thinking | Energy and matter: Flows, cycles, and conservation |
| Constructing explanations (for science) and designing solutions (for engineering) | Structure and function. |
| Engaging in argument from evidence | Stability and change. |
| Obtaining, evaluating, and communicating information |  |

| **Ohio’s Learning Standards for Science (OLS)** |
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| **Expectations for Learning - Cognitive Demands (Check all that apply)** |
| Designing Technological/Engineering Solutions Using Science concepts **(T)** |
| Demonstrating Science Knowledge **(D)** |
| Interpreting and Communicating Science Concepts **(C)** |
| Recalling Accurate Science **(R)** |

| **Ohio’s Learning Standards for Math (OLS) and/or**  **Common Core State Standards -- Mathematics (CCSS)** | |
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| **Standards for Mathematical Practice (Check all that apply)** | |
| Make sense of problems and persevere in solving them | Useappropriate tools strategically |
| Reason abstractly and quantitatively | Attendto precision |
| Construct viable arguments and critique the reasoning of others | Look for and make use of structure |
| Model with mathematics | Look for and express regularity in repeated reasoning |

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| **Unit Academic Standards (NGSS, OLS and/or CCSS):** |

LS 1-2 - Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.

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| **Materials**: (Link Handouts, Power Points, Resources, Websites, Supplies) |

Student science notebook, powerpoint with tables for students to copy, blood typing video, blood typing lab materials (see handout)

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| **Teacher Advance Preparation:** |

Create blood samples, create blood testing kits, create sample kits for groups

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| **Activity Procedures:** |

Day 1:

1. **Enter Slip:**Tabletop twitter: You and your group are going to circle around to all the large sheets of paper on the lab tables. You will have to “tweet” to each of the hashtags on that table. All of the hashtags are related to the blood typing video you watched last night. You are not allowed to switch tables until you hear the sound.
   1. Hashtags: Karl Landsteiner, Antigens, Rh Factor, Protein Codes, Blood Donor, Blood Matches
   2. 2 minutes per table
   3. Review and Q&A when finished
2. CSI Lab
   1. Pass out lab handouts
   2. Students read directions, summarize in group, summarize to class
   3. Who is the victim? Who are the suspects? What evidence do you have?
   4. Demo how each station will work.
      1. Take notes
      2. Write observations
      3. Why is it important to write down everything you see?
   5. Students each get a “type test” kit to fill out the chart on the top of the page (10 minutes)
   6. Students get 5 minutes per station
3. **Exit Slip:** Please write down your answers to the three essential questions in your notebook. I will be asking you the answers before you leave class, so be prepared!

Day 2:

1. **Enter Slip:** Take out your labs. We are going to finish all our testing today. Be ready to start as soon as Ms. Lafin finishes attendance and reviewing directions.
2. Finish Lab
3. Blood Typing Lab Reflection - in your notebook, please answer the following questions using complete sentences. You may not use the words “it”, “like”, “thing”, or “stuff”. Pretend you are answering these questions as an expert witness in the trial of the suspect you identified.
   1. How would you improve the blood testing from the crime scene?
   2. Can you elaborate on the reason you think the evidence points to the suspect?
   3. What could be done to minimize errors in the testing of the blood samples?
   4. Suppose you had another sample of blood from the crime scene. What would you do?
   5. Can you formulate a theory as to how the suspect’s blood got to the crime scene?
   6. How could you prove that the suspect was at the crime scene? Would you need only the blood evidence that you have given to the court, or would you need more evidence?
   7. How would you rate the quality of the evidence? Do you think it is enough evidence to convict the suspect?
   8. Based on the evidence presented, do you think the suspect is innocent or guilty? Please explain your answer.

**Reflections are due at the next class period**.

**Formative Assessments:** Link the items in the Activities that will be used as formative assessments.

Check tabletop twitter for misconceptions and basic understanding, circulate through groups during lab to identify misconceptions and guide students toward scientific practices, spot-check notebook responses to determine if learning has taken place

**Summative Assessments:** These are optional; there may be summative assessments at the end of a set of Activities or only at the end of the entire Unit.

Unit test at the completion of this unit and the subsequent unit.

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| **Differentiation:** Describe how you modified parts of the Lesson to support the needs of different learners.  Refer to Activity Template for details. |

Used a paper activity as an introduction to antigens and antibodies. Most students had little to no knowledge about blood typing before this activity, and the paper activity helped them understand what was happening in the lab.

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| **Reflection:** Reflect upon the successes and shortcomings of the lesson. |

This lab is a total hit! The students definitely understand what is happening with blood clotting, and I know this based on conversations I had with students while working with them, as well as what they wrote in their conclusion questions. We were able to use blood typing to introduce several other subjects in our class, including biochemistry and cellular structure. Students not only remembered what they did, but they were able to apply it to new knowledge. This lab takes a lot of work to set up at the beginning, but it is definitely worth all the hard work to see the students really take an interest in science.