Lesson Title	Blood Business
Length of Lesson	3 Class Periods (Block Schedule)
Created By	Torri Clay
Subject	Human Anatomy and Physiology/Biology/Genetics
Grade Level	10-12
State Standards	Biology: **5b, Genetics 3b, Human A&P 3o**
DOK Level	2
DOK Application	Apply, Demonstrate, Identify
National Standards	9-12 A (Inquiry); C (Life Science); E (Science and Technology)

Student Learning Goal:

National Standards

9-12A: Identify Questions and concepts that guide scientific investigations.

A: Design and conduct scientific investigations

A: Communicate and defend a scientific argument

C: The cell – cells store and use information to guide their function. The genetic information stored in DNA is used to direct the synthesis of the thousands of proteins that each cell requires

C: The Molecular basis of heredity – In all organisms, the instructions for specifying the characteristics of the organism are carried in DNA

E: Propose designs and choose between alternative solutions

E: Implement a proposed solution

E: Understandings about science and technology – scientists in different disciplines ask different questions, use different methods of investigations, and accept different types of evidence to support their explanations.

Biology

5. Demonstrate an understanding of the molecular basis of heredity.

b. Utilize Mendel's laws to evaluate the results of monohybrid Punnett squares involving complete dominance, incomplete dominance, codominance, sex linked, and multiple alleles (including outcome percentage of both genotypes and phenotypes.)

Genetics

3. Apply the principles of heredity to demonstrate genetic understandings.

b. Apply classical genetics principles to solve basic genetic problems. (DOK 2)
Genes and alleles, dominance, recessiveness, the laws of segregation, and independent assortment

Human Anatomy and Physiology

3. Demonstrate an understanding of the structure, functions, and relationships of the body systems.

o. Demonstrate an understanding of the structures and functions of the circulatory system and their role in maintaining homeostasis. (DOK 2)

Blood types and the four parts of blood in terms of morphology,

- function and origin
- Pulminary and systemic circulation
- Systolic and diastolic pressures in relationship to cardiovascular health

Classroom Objectives

- TSW identify different blood types and their genotypic composition
- TSW identify the antigens and agglutinins of each blood type
- TSW predict which blood types are compatible donors and recipients
- TSW construct punnett squares using their prior knowledge on genetic inheritance to determine possible genotypic/phenotypic results of the blood types of offspring of different crossed parents
- TSW determine their blood type and Rh factor using their own blood

Materials Needed (supplies, hand-outs, resources):

***the following supplies are based on a set up of six groups.**

- **Forensic Science Blood Typing Basics (sciencespot.net)**
- 2 cups milk
- 6 boxes of toothpicks
- 2 bottles of food coloring – red and green
- Vinegar
- 18 small dropper bottles
- 2 cups water (+ additional water for the serum bottles)
- 18 small cups (Dixie cup size)
- 6 small plastic storage containers
- 6 permanent markers
- Labels for bottles and containers
- **Forensic Science Blood Typing Basics Powerpoint (sciencespot.net)**
- **Forensic Science Blood Typing Basics Notes (sciencespot.net)**
- **Forensic Science Blood Typing Basics Quiz (sciencespot.net)**
- **Blood Typing Kit for student use**

Lesson Performance Task/Assessment:

Students will apply what they learned in the lesson on the characteristics and genetics of blood to solve an investigation. The students will perform a variety of tasks including the construction of punnett squares, the matching of donors, and actual experimentation of the blood typing process. The quiz that goes with this lesson is directly related to the lesson and the lab and serves as a great assessment for student knowledge.

Lesson Relevance to Performance Task and Students:

This lesson gives students a hands-on experience of how blood is donated from one subject to another. It also enhances student knowledge on the concepts related to the blood and the specific antibodies and agglutinins.

Anticipatory Set/Capture Interest:
The teacher will lead the discussion by introducing a short conversation about the students' favorite investigation shows (CSI, Bones, Criminal Minds, Dr. G Medical Examiner, Law and Order, House, etc.). Students will give examples of shows they remember which used blood forensics to determine the result. After student input, the teacher will show a short video clip of an investigation show demonstrating the use of blood forensics and explain to students that they now have all the information at hand to perform a procedure similar to what they see on TV.

Guided Practice:
After the material has been covered on the characteristics of blood and the genetics of blood typing, the teacher will lead the students through the following events:

Day One
The teacher will lead the lesson and guide the students through several practice problems and examples such as how to construct punnett squares for blood types, and how to examine blood during blood typing to determine if it is compatible.

Day Two
After reviewing homework, the teacher will lead the students through the lab on forensic blood typing basics.

Day Three
Today the students who turned in parent permission forms will perform the blood typing lab using their own blood.

Day Four
Students will complete the quiz

Independent Practice:
Students will complete individual problems during class (which the teacher will review during class after the students finish). Students will also work problems on their own for homework. Students will complete the lab in a group setting, however, they will each be responsible for individual contribution.

Remediation and/or Enrichment:
Remediation:

- Pair students with other students who understand the material
- Let students use visual materials to work on

- Give a simpler version of the activity
- IEP's will be followed

Enrichment:

- To further the lesson for other students, an activity will be devised where students have to match individuals to a specific family based on the information given about their blood types.

Check(s) for Understanding:

1. Inquiry questions will be asked throughout the lesson. Students will respond by using their response systems, or by being called on randomly during the discussion. The questions will include, but will not be limited to:
   - What are all possible genotypes of the four blood types?
   - In a setting where there is no blood typing apparatus, how is it possible to determine if two blood types are compatible?
   - Which blood type is the universal donor?
   - Which blood type is the universal recipient?

2. Students will be evaluated on their participation and contribution to the lab
3. The quiz will be graded and evaluated to determine how well the students understand and are able to apply the material.

Closure:

Students will discuss how the lesson relates to the shows they watch on TV. They will also reflect on the information they learned and will be asked to note specific examples of things they know that they did not know before the lesson/lab.

Possible Alternate Subject Integrations:

Biology, Forensics, Genetics

Teacher Notes:

- Before beginning the lab activity, students should have a proficient understanding of genetic inheritance.
- Students should also have an understanding of each blood type and its characteristics
- Students should demonstrate an understanding of appropriate lab procedures and proper lab safety methods. This is EXTREMELY important when completing the blood typing lab
- As a precaution, all students participating in the lab should have signed parent permission forms allowing them to draw and examine their blood. This eliminates backlash from parents who may disagree with the procedure