**Lesson 4 – Genetics Terminology and Labs**

**Unit:** Genetics

**Main Ideas:** Inheritance Patterns, Variation, Genetic Structure and Terminology

**Standards 5.3 Life Science:** All students will understand that life science principles are powerful conceptual tools for making sense of the complexity, diversity, and interconnectedness of life on Earth. Order in natural systems arises in accordance with rules that govern the physical world, and the order of natural systems can be modeled and predicted through the use of mathematics.

**Strand: D. Heredity and Reproduction:** Organisms reproduce, develop, and have predictable life cycles. Organisms contain genetic information that influences their traits, and they pass this on to their offspring during reproduction.

**CPI: 5.3.8.D.2 Explain the source of variation among siblings.**

The unique combination of genetic material from each parent in sexually reproducing organisms results in the potential for variation.

**Lesson Timeline:** 4 Days Total

Day 1 – Introduction to Alleles and Terminology

Day 2 & 3–Chromosome Lab

Day 4 – Strawberry Lab

**Day 1: Terminology**

**Objective:** Students will be able to use genetics terminology to describe the physical traits and genes of organisms.

**Materials:**

PowerPoint: PRACCIS Genetics Lesson 4 - Day 1 Terminology Class

Word Doc: PRACCIS Genetics Lesson 4 - Terminology and Labs Teacher Packet

Word Doc: PRACCIS Genetics Lesson 4 - Day 1 Terminology Homework Student Packet

**Do now:** The front page of the homework has the Do Now. This can also be projected at the front of the room because it is the 1st slide of the PowerPoint.

**Procedure:**

First have students complete the do now. Then go through the PowerPoint slides for the terminology. Assign the homework and allow students to start on it in class with any time remaining.

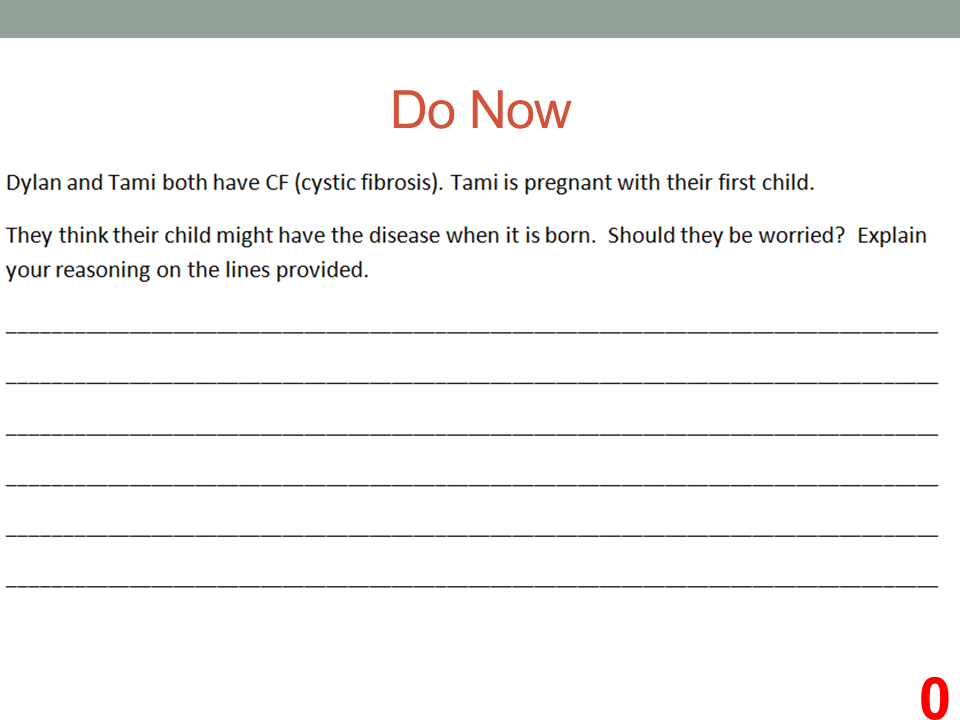
More detailed procedures are below.

**Assessment:** Slides 14 and 15 can be used to formatively assess students’ facility with some of the basic genetics terminology.

**Closure:** Slides 14 and 15 can also be used to close the lesson before assigning homework. The homework is brief and should probably be due the next day for most students.

**Homework:** Genetics Terminology Homework

**Modifications:** Planned by the teacher as it fits the needs of their particular students.



**Day 1: Terminology**

Open the PRACCIS Genetics Lesson 4- Day 1 Terminology Class PowerPoint.

The Do Now is the very first slide of the PowerPoint. This Do Now is also printed on one side of the homework handout for this lesson.

Take a minute or two to elicit student responses.

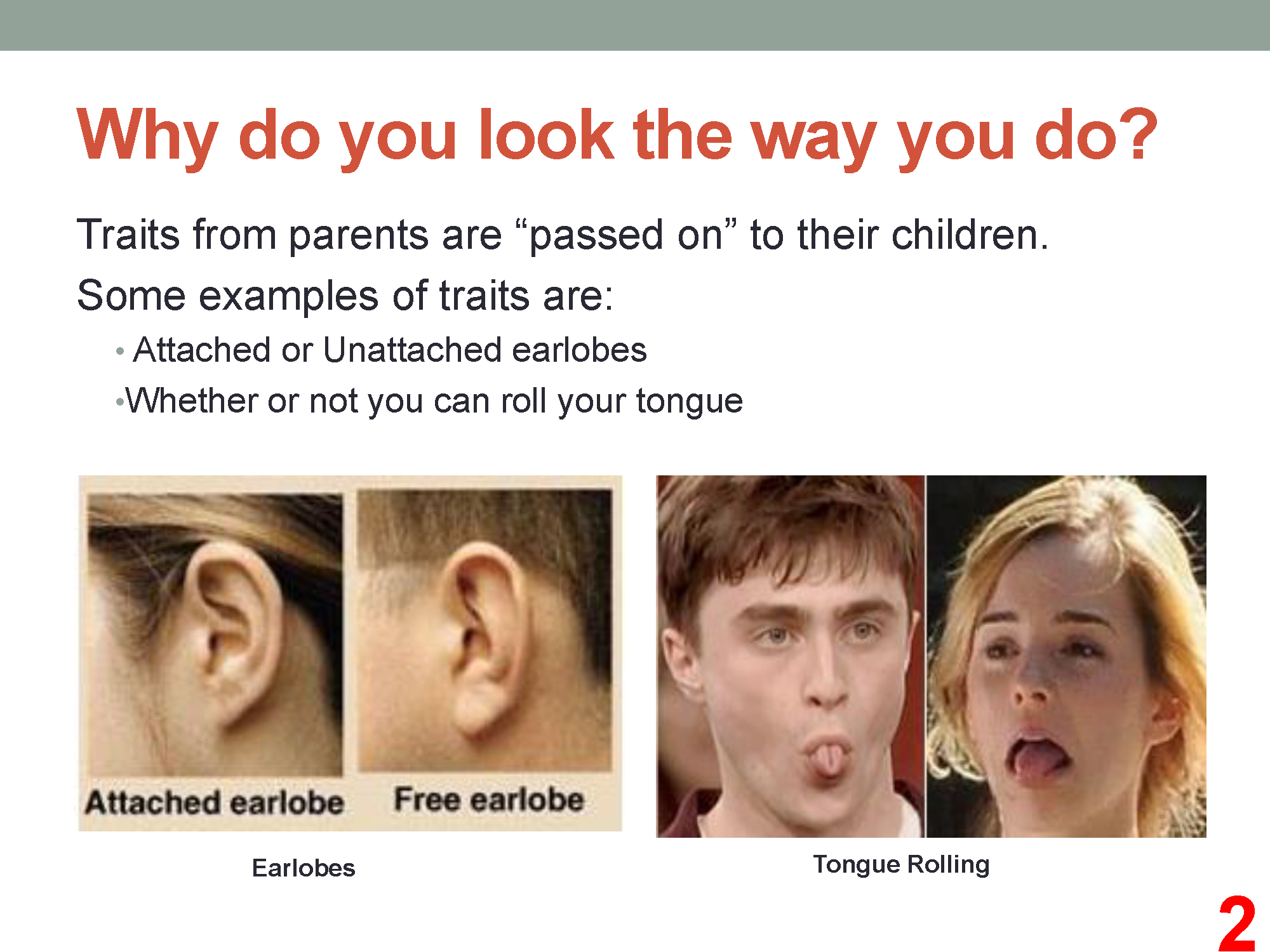
Remind students that yesterday we figured out that each trait has two genes and each person gets one gene from each parent.

In this case the child will get one “Yes-CF” gene from each parent and they will have CF. Remind students that each trait has two genes for example in CF you have “Yes-CF” and “No-CF.” It is awkward to keep calling these “Yes-CF” and “No-CF” so we need better terminology.

Explain that terminology in science is very important so you are clear when talking to one another.

“In this lesson we are going to learn some terms so we can be very exact when we are talking about genetics. This way we all understand what we are trying to tell each other. It is very important to learn these new words and the best way to learn them is to use them so we are going to practice using these words. From here on out I expect you to use these terms in your writing and when you are talking. ”

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**Day 1: Terminology**

**Open the PowerPoint “ISS2 Genetics Lesson 4 – Day 1 Terminology Class”**

The aim of this PowerPoint is to introduce students to the concepts surrounding alleles.

**Slide 1:** Review the idea that traits are inherited by children from their parents.

**Slide 2:** Emphasize the fact that **genes are information** and are the basic unit of heredity

**Slide 3 (not shown in the Teacher Packet):** Continue explaining that **alleles are the information for slightly different versions** of the same trait.

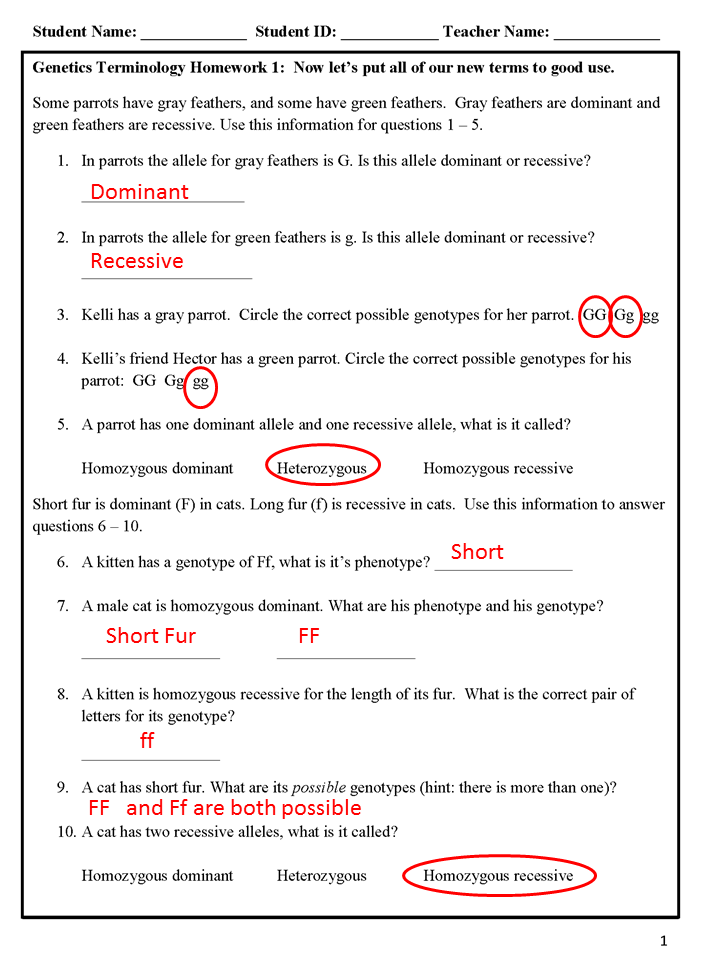
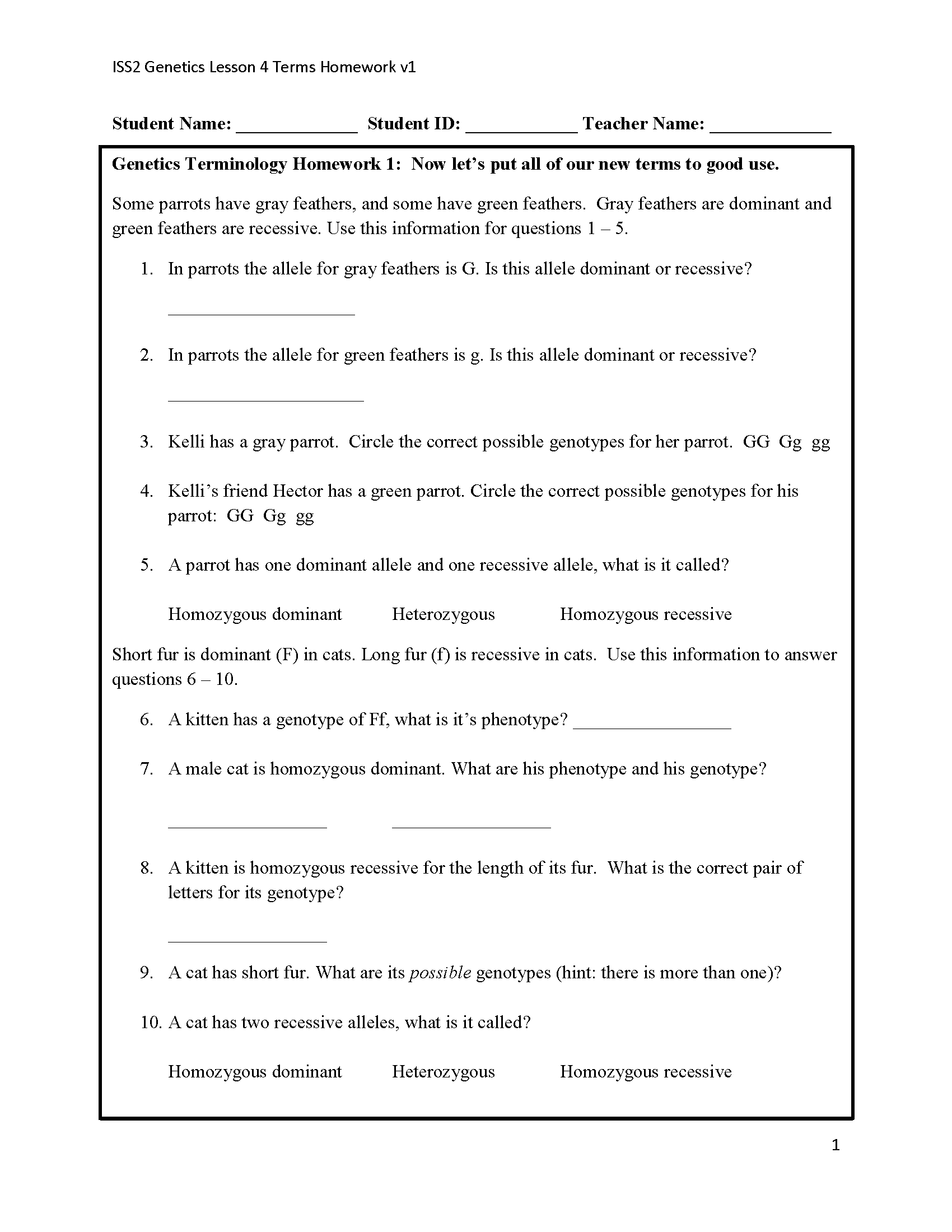
The goal, beyond learning some terminology, is to emphasize the informational nature of genes. Many of the remaining slides are very familiar concepts for experienced teachers and the content is fairly self-explanatory on each slide. Please note that many slides are revealed sequentially with animations that require a mouse click.

**Slide 13 (not shown in the Teacher Packet):** Assessment and Closure Question 1: Review with students the differences between genotype and phenotype.

**Slide 14 (not shown in the Teacher Packet):** Assessment and Closure Question 2: Review with students the differences between dominant and recessive alleles.

After slide 14 take a moment to assign the terminology homework worksheet shown on the next page. Note that the answer key is also on the next page.





**Day 2 – Chromosome Lab**

**Objective:** Students will be able to use genetics terminology to describe the physical traits and genes of organisms.

**Materials:**

PowerPoint: PRACCIS Genetics Lesson 4 - Day 2 & 3 Chromosome Lab Instructions Class

Word Doc: PRACCIS Genetics Lesson 4 - Day 2 & 3 Chromosomes Lab Worksheets Student Packet

**Do now:** The front page of the chromosome lab packet has the print copy of the Do Now. It is also the first slide of the PowerPoint presentation.

**Procedure:**

First have students complete the Do Now. Then spend about 20 minutes assembling their chromosomes and going through the powerpoint. Then start students on the chromosome lab packet. Close the lesson with the PowerPoint slides mentioned below.

More detailed procedures are below.

**Assessment:** Slide 15 can be used to formatively assess students understanding of what is represented by different elements of the physical model.

**Closure:** Wrap up the lesson with slide 15.

**Homework:** No homework.

**Modifications:** Planned by the teacher as it fits the needs of their particular students.

**Day 2 – Chromosome Lab**

**Unit:** Genetics

**Lesson:** 4

**Main Idea:** Inheritance Patterns, Variation, Genetic Structure and Terminology

**Standards 5.3 Life Science:** All students will understand that life science principles are powerful conceptual tools for making sense of the complexity, diversity, and interconnectedness of life on Earth. Order in natural systems arises in accordance with rules that govern the physical world, and the order of natural systems can be modeled and predicted through the use of mathematics.

**Strand: D. Heredity and Reproduction:** Organisms reproduce, develop, and have predictable life cycles. Organisms contain genetic information that influences their traits, and they pass this on to their offspring during reproduction.

**CPI:**

**5.3.8.D.2 Explain the source of variation among siblings.**

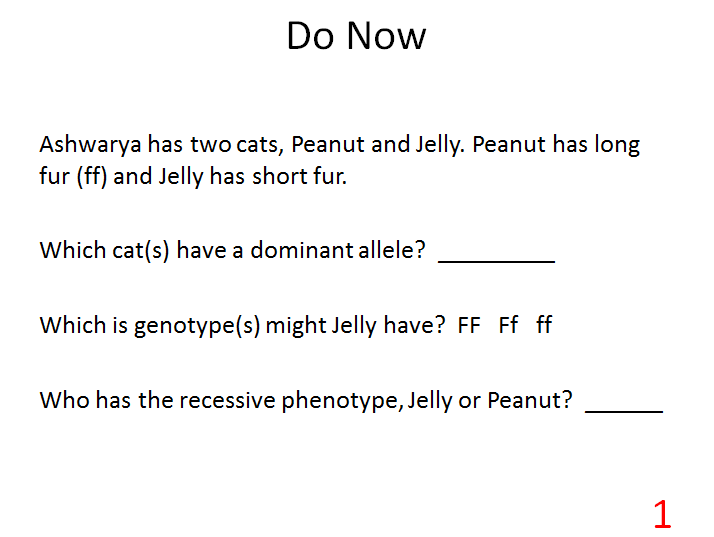
The unique combination of genetic material from each parent in sexually reproducing organisms results in the potential for variation.

**Lesson Timeline:** 4 Days Total

Day 1 – Introduction to Alleles and Terminology

Day 2 & 3 – Chromosome Lab

Day 4 – Strawberry Lab



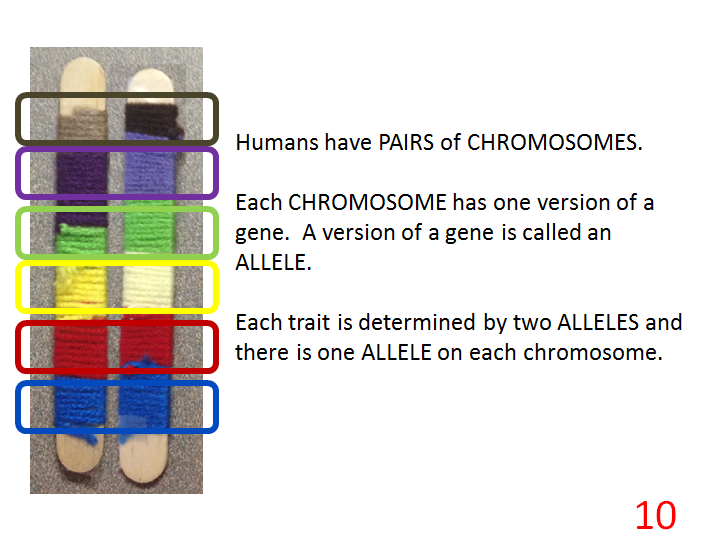
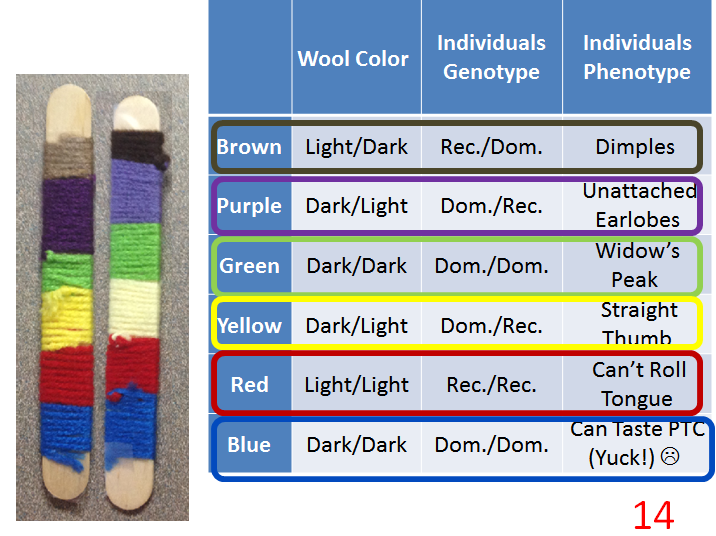
**Day 2 – Chromosome Lab**

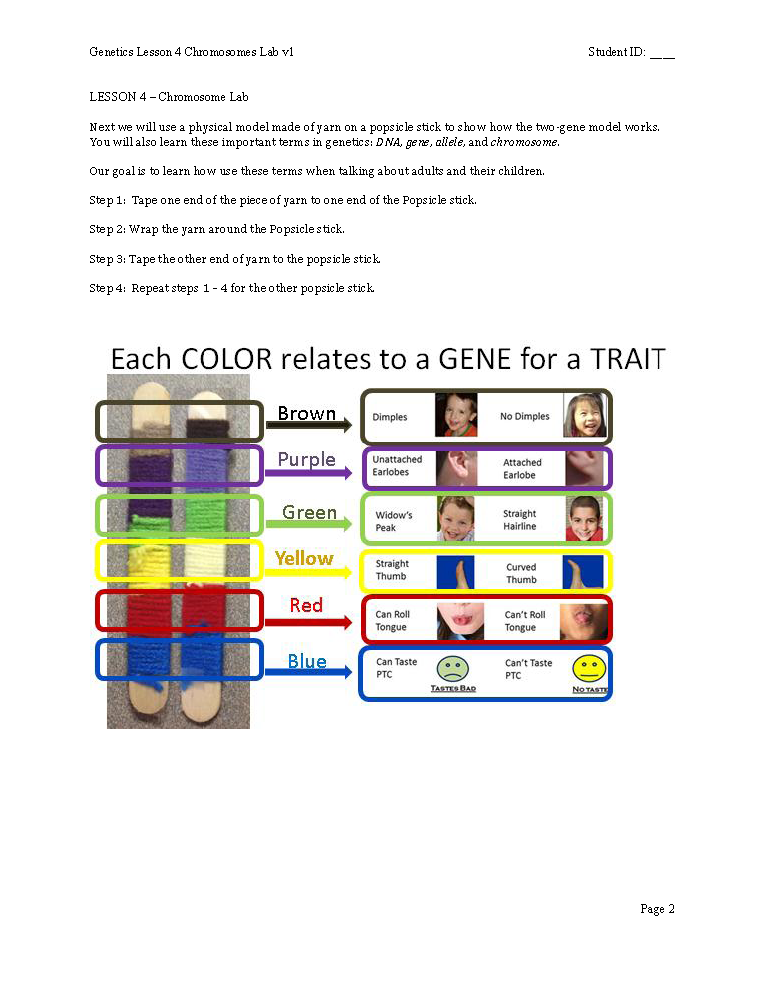
**Slide 1:** Have students complete the Do Now that is included in the student packet.

Then have students turn to page 2 of the lab packet. Walk students through the steps of making the model, making sure to emphasize the connections to the vocabulary.

**Slide 3, 10 and 14:** These slides provide a lot of opportunity for students to map the terminology onto the physical model. Throughout the lesson make sure to take time to model the use of the genetics terminology and encourage students do the same. This slide is also a good opportunity to emphasize part/whole relations.

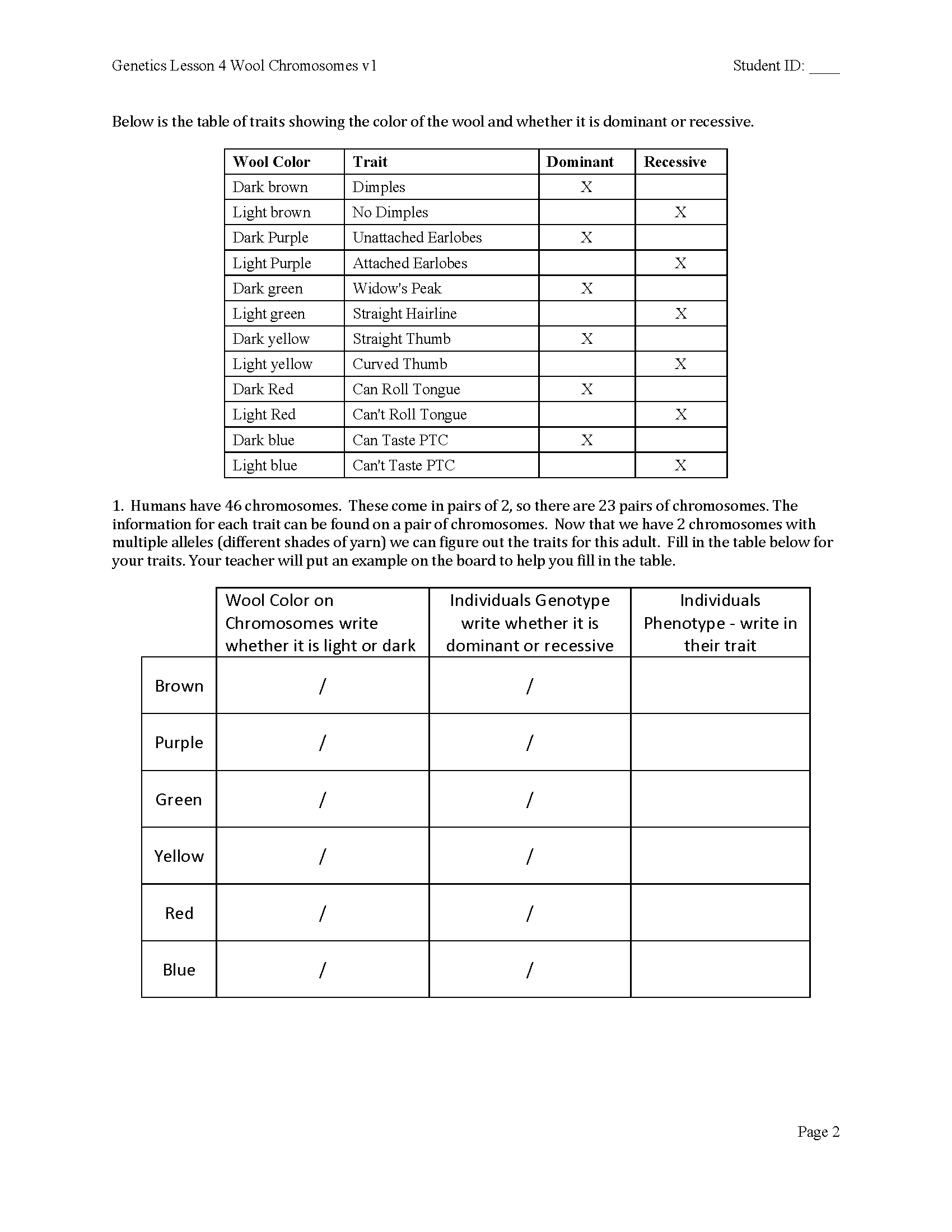
**Slide 14:** Leave this slide up on the projector while students work on mating their chromosome models.





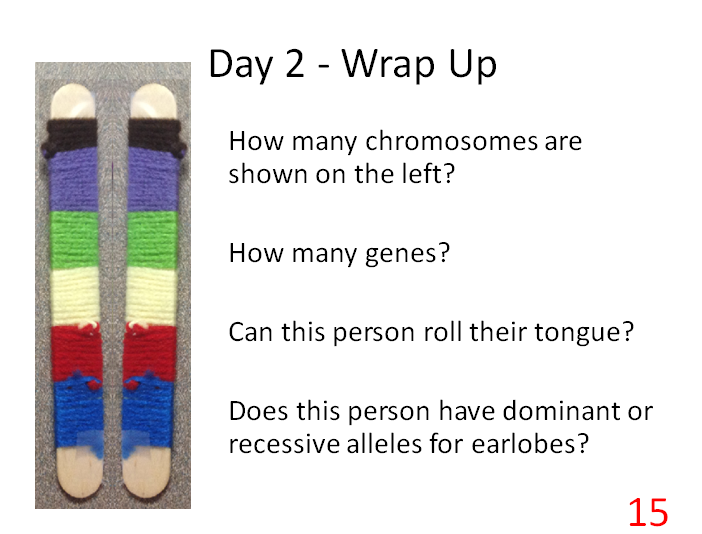
**Day 3 – Chromosome Lab**

**Page 2** of the packet shown on the left provides a quick set of instructions for how to assemble the model and what each color of string stands for.



**Day 3 – Chromosome Lab**

**Page 3** shown on the left includes a data table for students to document the genotype and phenotype of their individual. Have students complete the table and make sure that slide 14 from the PowerPoint is displayed to help them fill out the table.



**Day 3 – Chromosome Lab**

**Closure**: Close the lesson by having students answer a few questions regarding what various features of the model represent.

Leave at least 2-3 minutes for students to also unwrap the yarn from the popsicle sticks and put all the pieces back into the Ziploc bag.

**Day 3 – Chromosome Lab**

**Objective:** Students will be able to use genetics terminology to describe the physical traits and genes of organisms.

**Materials:**

PowerPoint: PRACCIS Genetics Lesson 4 - Day 2 & 3 Chromosome Lab Instructions Class

Word Doc: PRACCIS Genetics Lesson 4 - Day 2 & 3 Chromosomes Lab Worksheets Student Packet

**Do now:** This is slide 16 of the PowerPoint.

**Procedure:**

First have students complete the Do Now. Then spend about 20 minutes assembling their chromosomes and going through the PowerPoint. Then start students on the chromosome lab packet. Close the lesson with the PowerPoint slides mentioned below.

More detailed procedures are below.

**Assessment:** Slide 17 can be used to formatively assess students understanding of what is represented by different elements of the physical model.

**Closure:** Slide 17 of the PowerPoint.

**Homework:** No homework.

**Modifications:** Planned by the teacher as it fits the needs of their particular students.

**Day 3 – Chromosome Lab**

**Unit:** Genetics

**Lesson:** 4

**Main Idea:** Inheritance Patterns, Variation, Genetic Structure and Terminology

**Standards 5.3 Life Science:** All students will understand that life science principles are powerful conceptual tools for making sense of the complexity, diversity, and interconnectedness of life on Earth. Order in natural systems arises in accordance with rules that govern the physical world, and the order of natural systems can be modeled and predicted through the use of mathematics.

**Strand: D. Heredity and Reproduction:** Organisms reproduce, develop, and have predictable life cycles. Organisms contain genetic information that influences their traits, and they pass this on to their offspring during reproduction.

**CPI:**

**5.3.8.D.2 Explain the source of variation among siblings.**

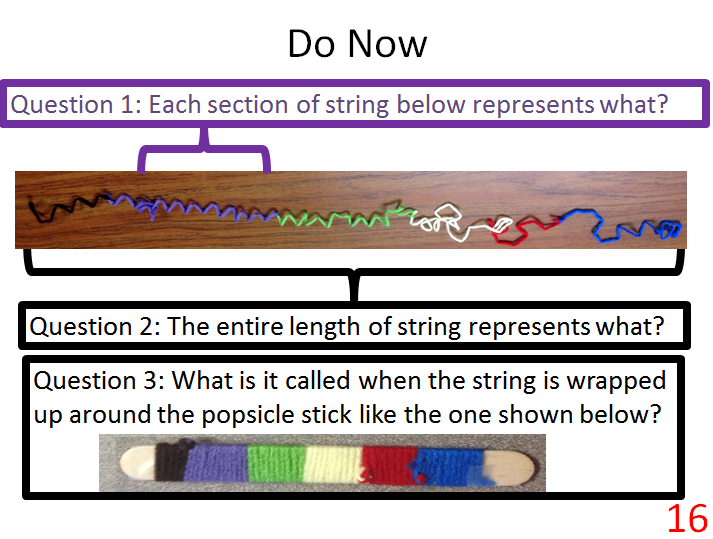
The unique combination of genetic material from each parent in sexually reproducing organisms results in the potential for variation.

**Lesson Timeline:** 4 Days Total

Day 1 – Introduction to Alleles and Terminology

Day 2 & 3 – Chromosome Lab

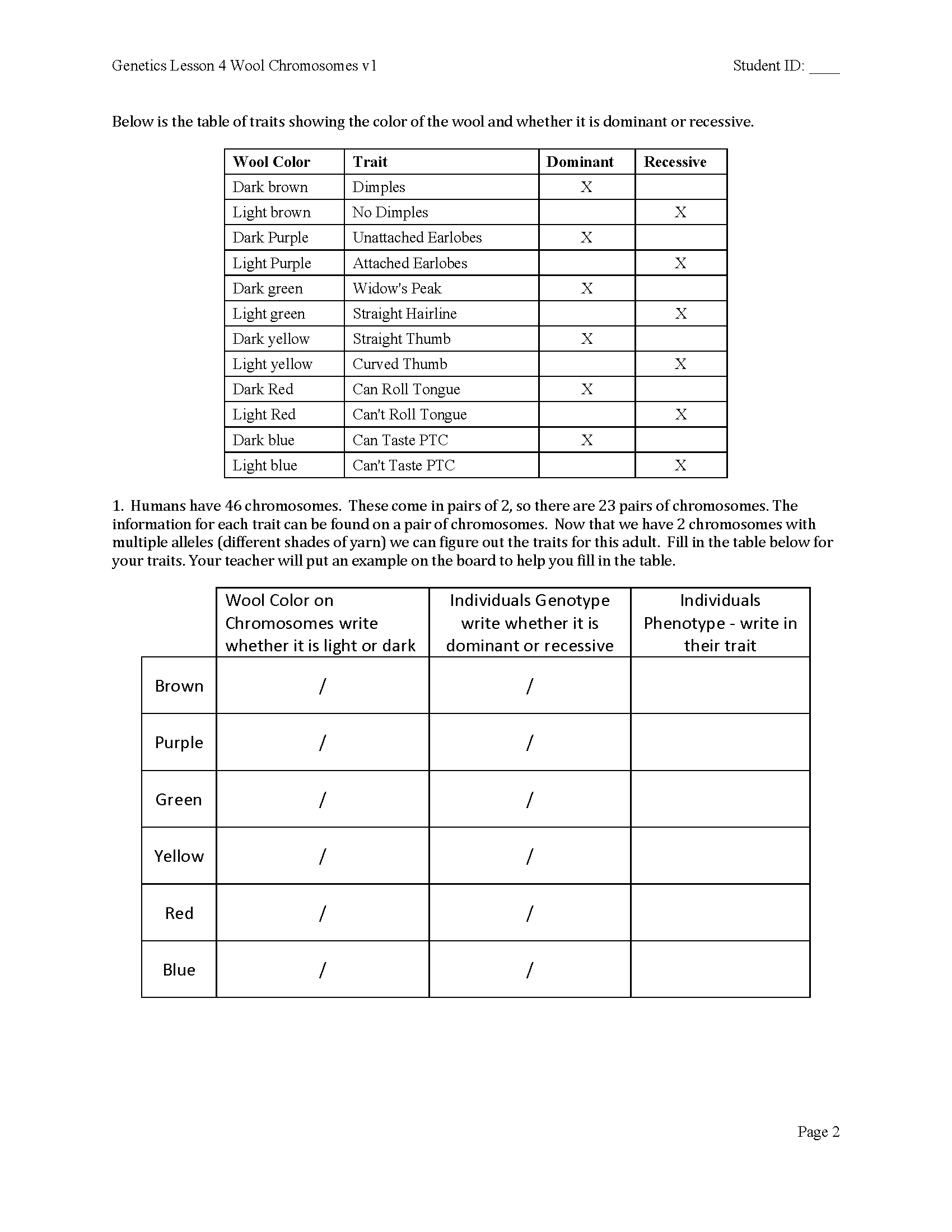
Day 4 – Strawberry Lab



**Day 3 – Chromosome Lab**

**Slide 16**: Start the lesson with the quick visual Do Now on slide 16. This do now does not need to be written down. Just take a moment to cover the 3 questions with the students to help them re-orient to the task they started yesterday. They will probably need to put the models back together. They can use the short instructions included in the packet on page 2 to help with this.

Important note: For day 2 it is very likely that students will have a different set of chromosomes than they had on day 1. This is o.k. because we are not tracking a parent’s offspring through time. Rather the students are just become familiar with the terminology and how different combinations of alleles represent different traits.



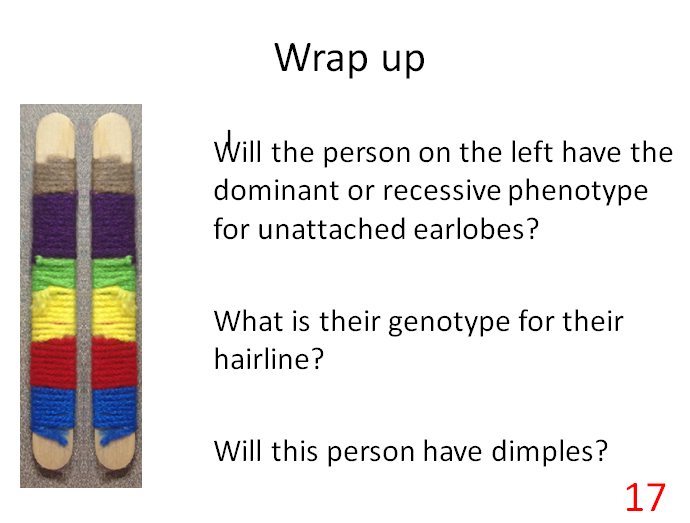
**Day 3 – Chromosome Lab**

**Page 4 of the packet**

Today students will mate a chromosome with their partner and record the traits of the new individual. This page is shown on the left. The goal is to simulate the relationship between parent genes and offspring genes and traits. Emphasize to students that this is simulating reproduction not just random chromosome swapping. Also emphasize that each parent contributes just one chromosome even though offspring and adults have two chromosomes (one from each parent).

Page 5 and 6 (not shown) are similar to page 4 but direct students to get new partners, mate chromosomes, and then record their new individuals.

It is not necessary for students to complete all 3 replications. (page 4, 5 and 6). Instead students should wrap up this activity at the end of the second day of the lab so that they can start the strawberry lab the following day.



**Day 3 – Chromosome Lab**

Wrap up the activity with slide 17 of the PowerPoint.

Make sure that students unwind the models when they are done.

**Day 4 – Strawberry Lab**

**Objective:** Students will be able to make accurate measurements and extra DNA from an organism.

**Materials:**

Word Doc: PRACCIS Genetics Lesson 4 - Day 4 Strawberry DNA Extraction Student Packet

PowerPoint: PRACCIS Genetics Lesson 4 - Day 4 Strawberry Lab Do Now and Closure Class

**Do now:** See slide 1 of the PowerPoint

**Procedure:**

More detailed procedures are below.

**Assessment:** Assess the “why” statements found on the back of the lab handout.

**Closure:** See slide 2 of the PowerPoint

**Homework:** No homework.

**Modifications:** Planned by the teacher as it fits the needs of their particular students.

**Day 4 – Strawberry Lab**

**Unit:** Genetics

**Lesson:** 4

**Main Ideas:** Inheritance Patterns, Variation, Genetic Structure and Terminology

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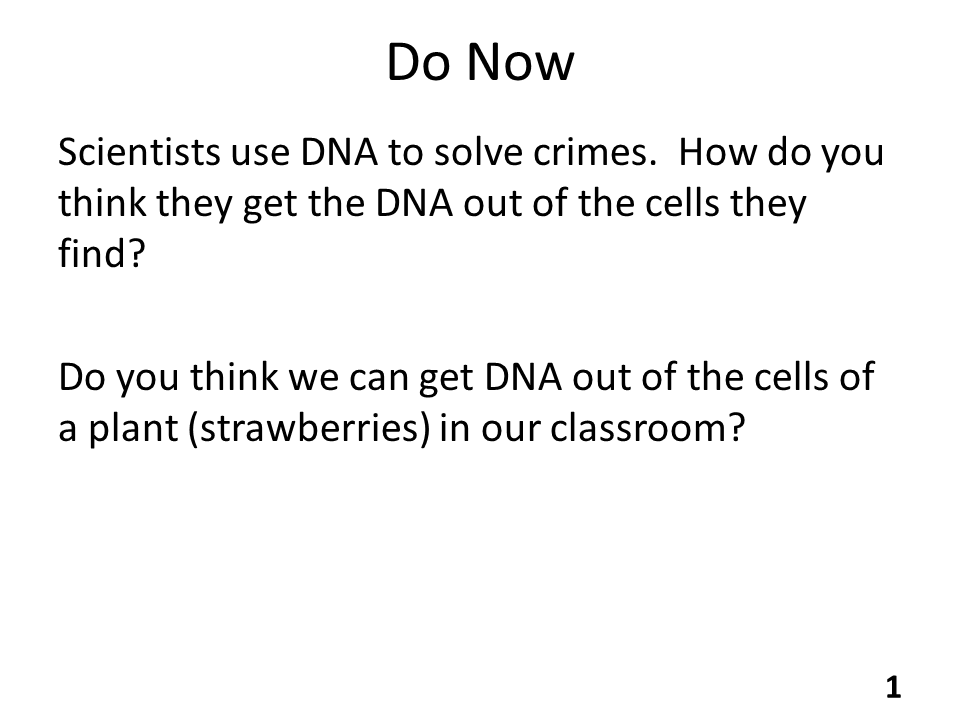
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Day 1 – Introduction to Alleles and Terminology

Day 2 & 3 – Chromosome Lab

Day 4 – Strawberry Lab

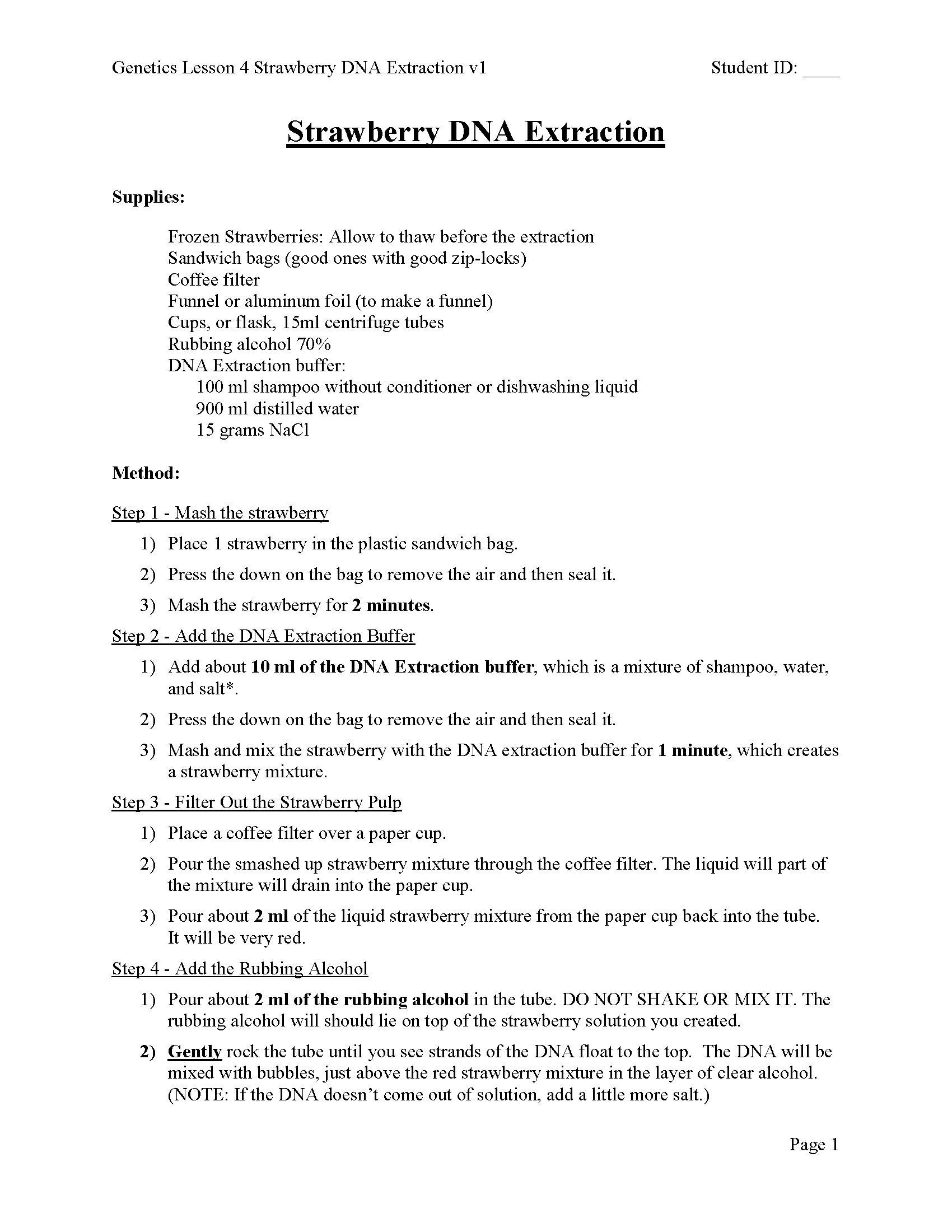


**Day 4 – Strawberry Lab**

**Do Now:** This do now is located on the PRACCIS Genetics Lesson 4 - Day 4 Strawberry Lab Do Now and Closure Class PowerPoint.

Slide 1: Spend just a minute or two eliciting student responses on these two questions. Note that the closure dovetails with the

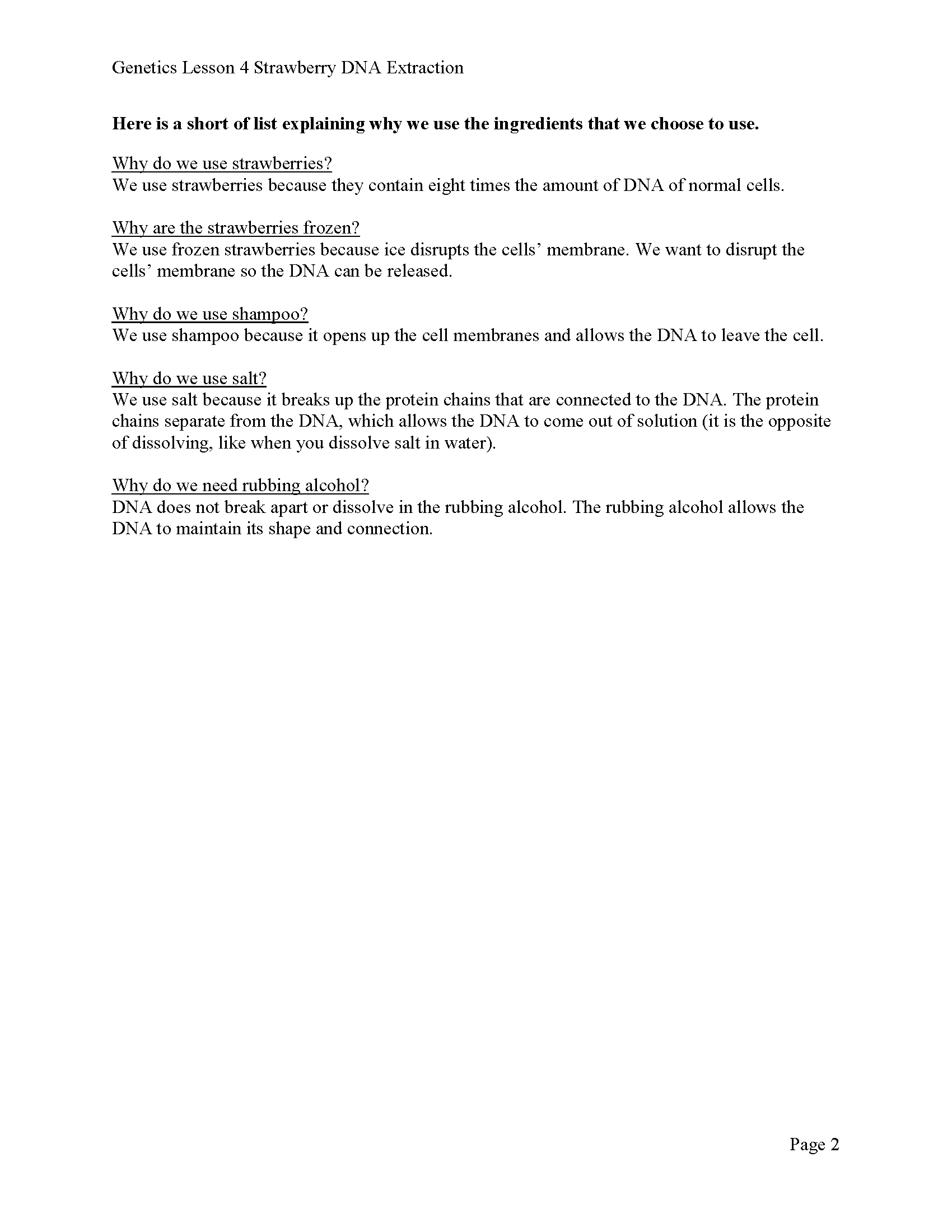
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**Day 4 – Strawberry Lab**

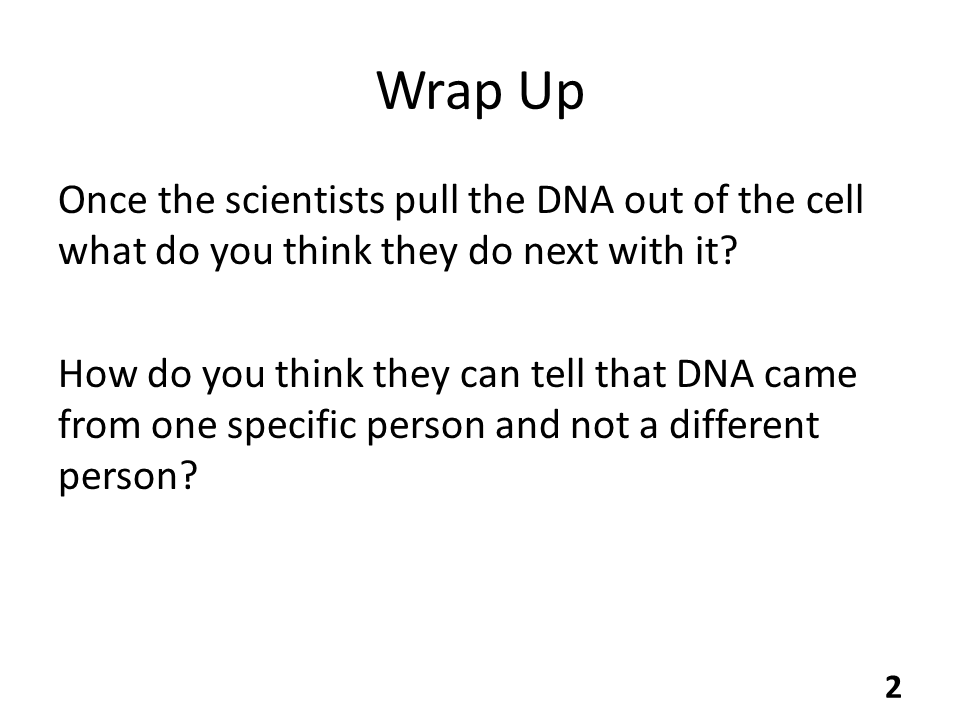
The aim of this lesson is to help students understand that DNA is present in all living organisms and that it can be physically and chemically manipulated.

It is also worth pointing out to them that the DNA is **not** the trait. You can’t look closely at, or zoom in on, any chunk of the DNA that they extract and “see the trait” for eye color, widows peak, curved thumbs, etc.



**Day 4 – Strawberry Lab**

Students should take a minute or two to read the “why” statements on the back of the lab sheet. These describe the reasons for particle procedures in the lab. Student knowledge of these particle reasons can be assessed with a quick verbal quiz.



**Day 4 – Strawberry Lab**

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