

Dragon Breeder's Handbook



Greetings new dragon breeder and welcome to the wonderful world of dragon genetics! To begin you must register your account at <https://learn.concord.org/>



Your password is **dragon** and your username is _____

Now you can log into your lab <https://geniverse-lab.concord.org/>

The first thing you must do to begin your quest is choose your character. _____

Read through the introduction slides then write a 1-2 sentence summary of the story so far:

When you get to the laboratory click on the **Case Log** in the center of the bottom part of the screen, you may have to scroll down.



Case 1: Enter the Drake

★★★★ Playground



★★★★ Challenge 1: Make a Drake

★★★★ Challenge 2: Good Things Come in Threes

Begin Case 1. Click on "Playground." Work through the activity and complete the following questions and tables.

1. In the table below, record the symbol for male and female drakes and describe the differences between them.

	Male	Female
Symbol		
Differences Between Male and female		

Click on the instructions  and help icons  to learn more about genetics terms. Based on what you know and what you can gather from these pages, try and define the following terms.

Gene _____

Allele _____

Chromosome _____

2. One trait at a time, starting with the metallic trait at the top of the chromosomes, list all the possible allele combinations you can make with its two pull-down menus. In the last column, give the appearance (what it looks like) for each combination you list. Use the table below to organize your thinking. An example is done for you in italics.

Trait	Possible Allele Combination	Appearance of Drake
Metallic	<i>Metallic - Metallic</i>	<i>Drake is Steel (metallic)</i>
Wings		
Forelimbs		
Hind Limbs		

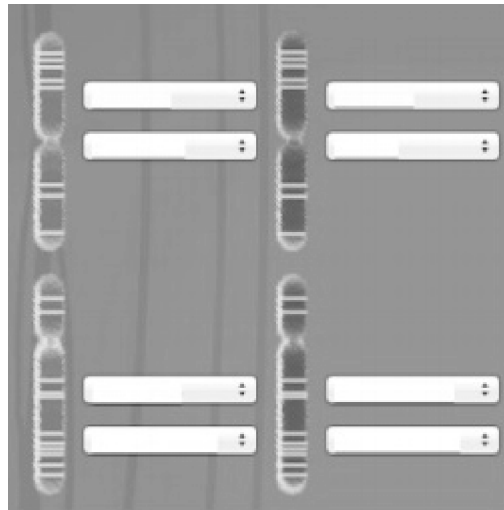
Challenge 1: Make a Drake Match the target drake by changing the pull-down menus and possibly sex. Use the table on this page to help you solve this challenge.

Circle the traits of the target drake	metallic	wings	forelimbs	Hind limbs
	non-metallic	No wings	No forelimbs	No hindlimbs

Sketch the Target Drake
(do your best and just
Make sure you include
The important traits)

Challenge 1 continued

1. Write in the alleles as they were on the right side
2. Describe what you did to match the target:



Challenge 2: Good things come in threes

Now you will need to match a series of three target drakes. Use this space to describe how well you did, what worked and what didn't work. Use the table on the previous page if needed.

Case 1 Reflection: Answer the following questions

1. What must be true for a drake to have wings?
2. What must be true for a drake to NOT have wings?
3. How do the other traits work?

Case 2

Take 3 minutes to silently answer the following question in the “I Think” Box:

In families of blood relatives, children look like their parents, but not exactly, and siblings look like each other too. How does meiosis help explain such observations?

I Think

We Think

Playground

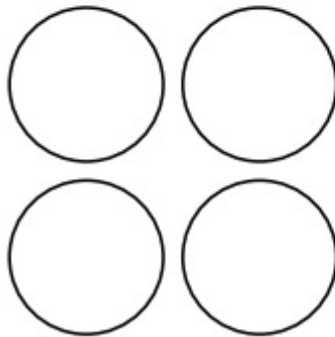
Bird, Bees, and Drakelings?

In order to breed drakes, you need to know where babies come from. Every baby drake starts when a sperm cell from its father fertilizes an egg cell from its mother. Each sperm or egg has one allele for every drake gene. These two cells, also called gametes, combine to give the baby a full set of chromosomes.

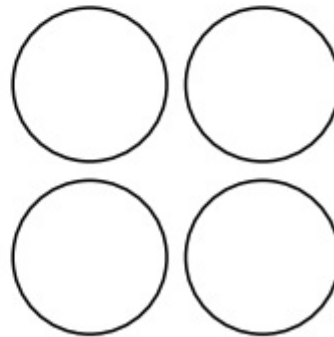
Making gametes with meiosis.

The Lab has a special tool you can use to watch meiosis in action. Drag a drake into the parent drake spot (yellow circle) to see its chromosomes. Place your mouse over each chromosome to see the alleles. Click the play button. One cell from a parent forms four egg cells or four sperm cells. To get a different mix of alleles in the gametes, click the <retry> button. When you are ready for a challenge, click <Bring it on!>.

1. In the parent pool, find a drake that has all four legs and wings.
 - a. Drag it to the parent drake yellow circle.
 - b. Run meiosis.
 - c. In the first set of gametes below, list the alleles for each gene that each gamete has. You do not have to draw the chromosomes.
 - d. Select <retry> and run meiosis again.
 - e. List the alleles for each gene in each gamete in the second set of pictures.



First meiosis run



Second meiosis run

2. Do the gametes from the first meiosis run have the same combination of alleles as the gametes from your retry of meiosis on the same drake? Explain why or why not.

3. Check to see if the same thing happens with the other three drakes. Use this space to record your results.

4. Circle one of the three underlined words to best complete this sentence.

When meiosis happens in the same drake multiple times, the gametes always/
never/ sometimes have the same combination of alleles.

Challenge 1: Making Babies

When gametes meet...

Drake breeders must learn how to pick the right sperm and egg to produce a target drakeling. You have been given one female and one male parent drake. Can you make the target drakes?

Make the target drakes

- Drag the mother and father drakes to the parent spots (yellow circles).
- Click play to run meiosis and make gametes for both parents.
- Mouse over the chromosomes to see the alleles.
- Choose an egg and sperm cell that will produce one of the target drakes.
- Drag the offspring to a target drake to see if it is a perfect match.
- Select another egg and sperm to match the other target drake. Drag to see if it matches.

1. Use this space to describe how well you did, what worked and what didn't work.

Challenge 2: Pick the Mommy

Which mom can produce both target drakelings?

If the chromosomes do not assort into the gametes the way you need them to, remember to use the <retry> button. Each <retry> will give you another random chance to get what you need.

Tips for Trainees:

When you drag a drake to a parent spot, hover over the chromosomes to see the alleles before you run meiosis. You can drag the chromosomes to move them apart.

1. Which mother was able to produce both targets? Explain why.
2. Use this space to describe how well you did, what worked and what didn't work.

What you just experienced in Case #2 is called meiosis. Take 3 minutes to silently answer the following question.

What would you tell someone about the process and purpose of meiosis?