

# Genetics Lab



## Problems:

- 1) Can you predict the % of offspring with certain characteristics-if the genetic features of the parents are known.
- 2) Can you predict the genetic makeup of parents when only the characteristics of the offspring are known?

## Test Subjects

In 1947, a spacecraft allegedly crashed on a farm in Roswell, New Mexico. Among the wreckage 2-3 alien bodies were discovered, one of which was supposedly still living. The extra-terrestrials were taken to a top secret research facility, and the government covered up all traces of the wreckage and the bodies. Recently, Mr. Nardelli uncovered a top secret file on **Alien Genetic Research!** Apparently, scientists were trying to figure out the how Alien genes were passed on to their offspring. They even attempted to cross Alien genes with human genes! Mr. Nardelli is now wanted by the **NSA** and his life is in danger. It is up to you to determine the results of these crazy experiments, and uncover the government conspiracy, before it is too late!

## Alien Characteristics Key

### **Possible Phenotypes**

- Green Skin
- Blue Skin
  
- Suction Cups
- Webbed Fingers
  
- Antennae
- Arms
  
- 2 Eyes
- 4 Eyes
  
- Poisonous Bite
- No Poison

### **Possible Genotypes**

- GG or Gg
- gg
  
- HH or Hh
- hh
  
- AA or Aa
- aa
  
- EE or Ee
- ee
  
- RR or Rr
- rr

### Grading

<u>Amount completed</u>	<u>Score</u>
Problems 1-3:	7/ 10
Problems 4-5:	8/ 10
Problem 6:	+2
Problem 7-9:	+2
Problems 10-12:	+2
Max possible score:	14 / 10 ( 140%)

### **Slime Pets**

- Blue Slime BB
- Yellow Slime bb
- ? Bb

### Problem 1

A **hybrid green-skinned male** is crossed with a **pure green-skinned female**. Describe, in percent (%), the **phenotypes** and **genotypes** of their offspring.

**Female**

Phenotype: \_\_\_\_\_

Genotype: \_\_\_\_\_

**Male**

Phenotype: \_\_\_\_\_

Genotype: \_\_\_\_\_


Analysis of Offspring( Give percentages)

Phenotypes (trait description):	Genotypes (abbreviation):

### Problem 2

A **hybrid green-skinned male** is crossed with a **hybrid green-skinned female**. Describe, in percent (%), the phenotypes and genotypes of their offspring.

**Female**

Phenotype: \_\_\_\_\_

Genotype: \_\_\_\_\_

**Male**

Phenotype: \_\_\_\_\_

Genotype: \_\_\_\_\_


Analysis of Offspring( Give percentages)

Phenotypes (trait description):	Genotypes (abbreviation):

**Problem 3**

A male alien is crossed with a female alien. The male alien has suction cup fingers (**Hh**). The female alien has webbed fingers (**hh**). What will be the phenotypes and genotypes of their baby alien?

**Female**

Phenotype: \_\_\_\_\_

Genotype: \_\_\_\_\_

**Male**

Phenotype: \_\_\_\_\_

Genotype: \_\_\_\_\_


Analysis of Offspring ( Give percentages)

Phenotypes:	Genotypes:

**Problem 4**

Having **antennae**, is dominant over having **arms**, **aa**. Robbie the Alien has antennae (AA). His sister, Carmen, has arms. What are the **phenotypes** and **genotypes** of **their parents**? Please circle or label Carmen and Robbie in the Punnett Square.


**Analysis of Parents**

**Do not** use percents in your answer

Mom

Dad

Phenotype:	Genotype

Phenotype:	Genotype:

**Problem 5**

The aliens have brought little pets with them on their trip to Earth. They are little balls of slime that like to stick to walls and bounce around. They come in 3 different colors: **Blue, Yellow, and Green**. Scientists crossed two slime balls and produced 100 offspring. The offspring produced were: **25 % Blue Slime, 50 % Green Slime, and 25 % Yellow Slime**. In order to produce these results, what color were the parent slimes?


Analysis

**Do not** use percents in your answer

Phenotypes of Parents:	Genotypes of Parents:

What genetic rule about dominance explains why there is Green Slime?:

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**Optional Challenge Problem 6**

Several aliens were crossed with humans to see what the results would be. Two traits were crossed, and they discovered that **Two Eyes** is dominant over **Four Eyes**. Having **Poison Bite** is also dominant over having **No Poison**. Two **hybrid** Humanoids ( for both traits) are crossed. What are the phenotypes and genotypes of their offspring?


- 2 Eyes = **EE or Ee**
- 4 Eyes = **ee**
- Poison = **RR or Rr**
- No Poison = **rr**

Analysis:

Phenotypes:

% 2 Eyes and Poison: \_\_\_\_\_

% 2 Eyes and No Poison: \_\_\_\_\_

% 4 Eyes and Poison: \_\_\_\_\_

% 4 Eyes and No Poison: \_\_\_\_\_

Genotypes (Hint: there are 9):

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

## Color Blindness and Sex Linked Traits

Males have an X Y pair of chromosomes that determine their gender (sex). Females have an XX pair.

In other words: Males are **XY**  
Females are **XX**

The gene for normal color vision is located on the X chromosomes of both males and females...

A male with normal vision would be written like this: **X<sup>n</sup>Y**

A female with normal color vision could be written like this: **X<sup>n</sup>X<sup>n</sup>**

n = normal color vision

Only one gene is responsible for normal color vision in **males**. The Y chromosome does not have any gene for color vision.

Two genes are responsible for normal color vision in **females**.

**Color blindness** is caused by a defective gene on the X chromosome in males and females.

A male with color blindness would look like this: **X<sup>c</sup>Y**

In females color blindness occurs only when the defective gene appears on both X chromosomes.

A female with color blindness would look like this: **X<sup>c</sup>X<sup>c</sup>**

The gene for normal color vision is **dominant** over the gene causing color blindness.

**Optional Challenge Problem 7:** What are the possible offspring produced by a color-blind father, and a pure normal mother?


Analysis: (give percentages)

Phenotypes:	Genotypes:

**Optional Challenge Problem 8:** Analyze the offspring produced by a normal father and a normal mother carrying one gene for color blindness.


Analysis: (give percentages)

Phenotypes:	Genotypes:

**Optional Challenge Problem 9:** Analyze the offspring produced by a color blind father and a normal mother carrying one gene for color blindness.


Analysis: (give percentages)

Phenotypes:	Genotypes:

There are four basic Human Blood Groups (Types). The chart below shows these groups and their genotypes. Problems 10-12 pertain to blood types.

**Optional Challenge Problem 10**

A male has type **AB** blood and a female has type **B** blood,

<u>Group(phenotype)</u>	<u>Genotype</u>
<b>O</b>	<b>OO</b>
<b>A</b>	<b>AA or AO</b>
<b>B</b>	<b>BB or BO</b>
<b>AB</b>	<b>AB</b>



a. What are the probable **phenotypes** and **genotypes** of any offspring?

Phenotypes: \_\_\_\_\_ Genotypes: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

b. Could they have a baby that has type **O** blood? \_\_\_\_\_ Explain.

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**Optional Challenge Problem 11**

A baby has type **B** blood. Write down all of the possible **genotypes** of the parents.




Possible genotypes: Mom paired with.....  
 \_\_\_\_\_  
 \_\_\_\_\_ paired with.....  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Dad  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

### Optional Challenge Problem 12

There are four children in a family. The chart below shows their blood types:

<u>Person</u>	<u>Type</u>
#1	AB
#2	A
#3	O
#4	B

Use the Punnett Squares to determine the answer to the following questions

a. Is it possible for a family to have these blood types ? \_\_\_\_\_




b. If it is possible, describe the phenotypes and genotypes of their parents.