

Purpose

To examine genetic inheritance: how traits are passed on from parents to offspring.

Background

Every family has observable characteristics, or traits, that are passed on from parents to their children. We can categorize these traits in two different ways: as genotype and phenotype. A person's **genotype** is the set of genes that they carry (what their DNA 'says'). Their **phenotype** is their observable characteristics (what we can see). Different versions of the same gene are called **alleles**. To keep things simple, we give the genotype a two-letter code. You will be given codes to use in your exercise.

The following chart gives an example of genotype and phenotype for three different-coloured carnations: red (A), white (B) and pink (C).

Flower	Phenotype (colour)	Genotype (two-letter code – case sensitive!)
A	Red	BB
B	White	bb
C	Pink	Bb

Each letter of the two-letter code is an allele. Remember that you get two copies of each gene: one from mom and one from dad. Note that the red flower got two copies of the same allele, while the pink flower got two copies of different alleles.

Materials for each group

- 2 alien 'parents'
- Pen or pencil
- Scissors
- Beaker
- Glue or tape
- Crayons or pencil crayons

Procedure

1. Meet your partner at your station. Receive two pictures of "aliens" from the instructors. Assign one alien to be the "mom" and the other the "dad". You will be "crossing" these two aliens to create a beaker baby!

2. Based on phenotypes (what we see), figure out the genotypes (what the DNA really says) of your alien. Do this by circling the appropriate phenotype for each trait in **Table 1**. The corresponding genotype is listed. Write this code in the genotype column. *See the example here:*

What we see				Genotype (case sensitive)
B. Hair Colour	Red = HH	Pink = Hh	White = hh	Hh
C. Hair Curl	Curly = MM	Wavy = Mm	Straight = mm	MM

3. Write the corresponding alleles for each trait (one letter per box) in **Table 2**. Each letter represents an allele version of that gene. The information for the “mom” should go on one colour and the “dad” information on the other colour. *See the example here:*

Trait	Genotype	
	Version 1	Version 2
B. Hair colour	H	h
C. Hair Curl	M	M

4. From **Table 2** cut out each allele and place all of the alleles for the “mom” and for the “dad” into the beaker.
5. **Shake the beaker to mix all of the versions!** Randomly draw out different colours for each trait from the beaker so that you create complete genotypes for each trait. Remember: Each trait needs a version of the gene from “mom” and a version of the gene from “dad”.
6. As you draw out versions, write them in the “what the DNA says” columns in **Table 3 (Child’s Genetic Make-Up)**.
7. Go back to the **Table 1** and determine the traits of the offspring and put the information in the “what we see” column of **Table 3**.
8. Draw a **detailed picture** of your offspring with the appropriate traits based on their genotype. Be certain to use arrows and clearly label all 8 traits of your offspring. 😊

Table 1 - Traits and Genotypes of your “Alien”

Circle what you see and write the genotype for your alien in the last box.

Trait What you See	Phenotypes			Genotype (case sensitive)
B. Body colour	Orange = BB	Pink = Bb	Blue = bb	
H. Hair colour	Red = HH	Pink = Hh	White = hh	
M. Hair curl	Curly = MM	Wavy = Mm	Straight = mm	
A. Antenna	2 = AA	1 = Aa	None = aa	
E. Eye colour	Brown = EE	Green = Ee	Blue = ee	
N. Nose	Trunk = NN	Parrot = Nn	Button = nn	
L. Hairy arms and feet	Very hairy = LL	Some hair = Ll	No hair = ll	
R. Tongue roll	Roller = RR	(Rr = Roller)	Non-Roller = rr	

**note: If your alien is a tongue roller, you chose whether their genotype is RR or Rr.*

Transfer the information to **Table 2** for cutting.

Table 2 - Personal traits – Versions of the gene separated for your “alien”

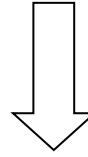
Write the corresponding alleles for each trait in (one letter per box) below. Each letter represents an allele version of that gene. The information for the girl should go on one colour and the boy information on the other colour.

Trait	What the DNA says	
	Allele 1	Allele 2
B. Body colour		
H. Hair colour		
M. Hair curl		
A. Antenna		
E. Eye colour		
N. Nose		
L. Hairy arms and feet		
R. Tongue roll		

**When you finish filling out the table, cut along the dashed lines*

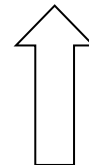
Table 3 - The Child's Genetic Make-Up

Shake the beaker to mix all of the versions! Randomly draw out different colours for each trait from the beaker so that you create complete genotypes for each trait. Remember: Each trait needs a version of the gene from “mom” and a version of the gene from “dad”. As you draw out versions, write them in the “what the DNA says” columns.



Trait	What the DNA says		What we see
	<i>allele from “mom” alien</i>	<i>allele from “dad” alien</i>	
B. Body colour			
H. Hair colour			
M. Hair curl			
A. Antenna			
E. Eye colour			
N. Nose			
L. Hairy arms and feet			
R. Tongue roll			

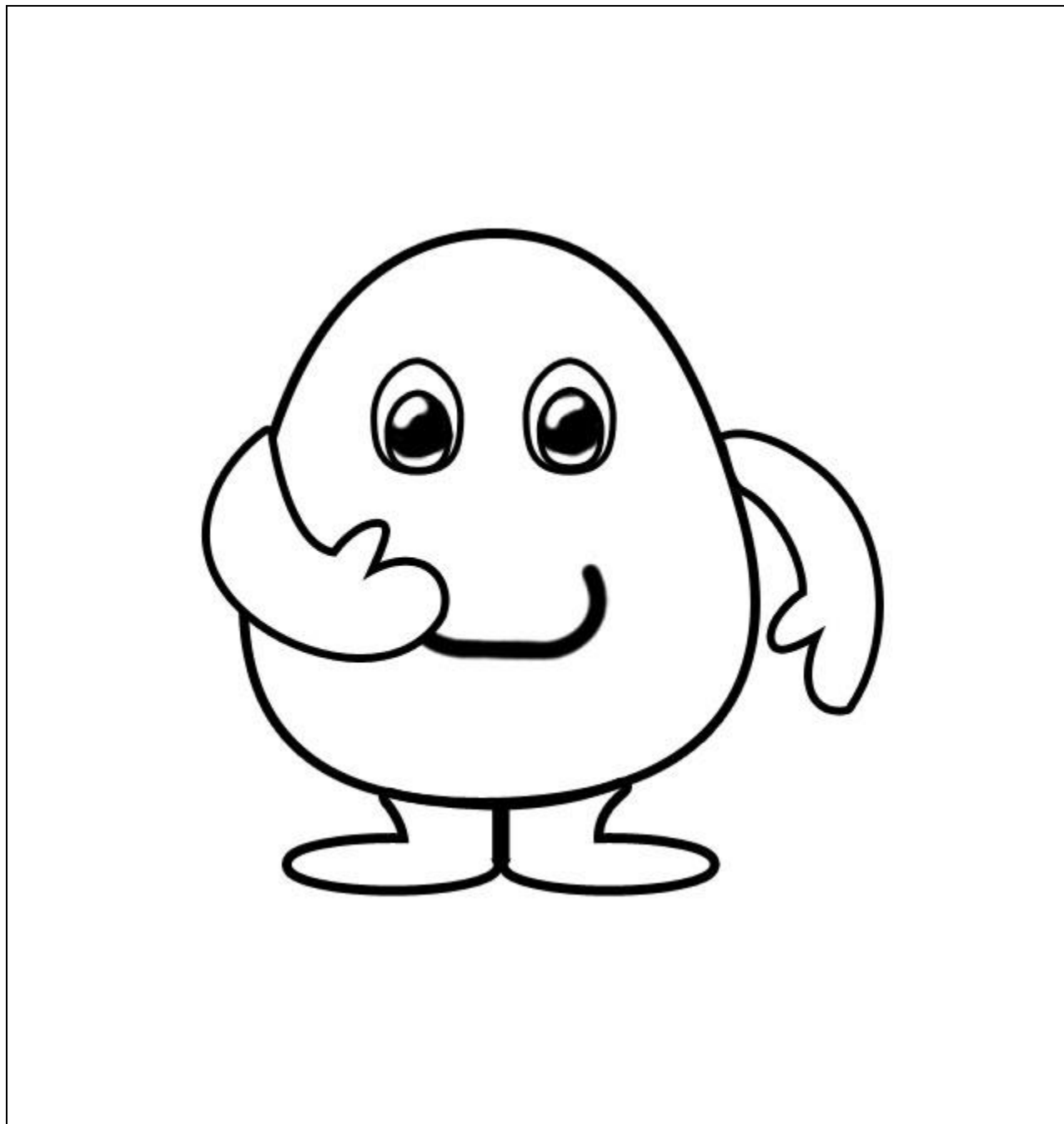
Go back to **Table 1** and determine the traits of the offspring and put the information in the “what we see” column.



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Figure 1. The Child.

Draw and colour a **detailed picture** of your offspring with the appropriate traits based on his or her genotype. Be certain to use arrows and clearly label all 8 traits of your offspring.



The Aliens for “crossing”

