

## Star Crossings - Instructions

This activity is designed to introduce the concept of allele inheritance from parent to child.

Students should work in pairs. Each pair of students should get 5 handouts (3 white and one of each colour).

Each pair should have two different coloured sheets. One colour will represent female alleles and the other will be for the male alleles. The students do not have to work as male-female pairs because they are mating stars and not their own gametes.

The procedure is very detailed, with lots of transferring letters back and forth, so make sure that students are following along correctly. *Make sure you are very familiar with the procedure!*

### Before beginning:

Review the students' knowledge of inheritance, genes, and alleles. Go over information such as:

- Genes code for proteins.
- What are traits?
- What are genetic traits?
- How do we obtain our genetic content? Review the combining of DNA from parents.
- How many chromosomes do we have? How many from Mom? Dad?
- What is an allele?
- How can we write/describe genotypes? E.g.: AA, Aa, aa
- How does genotype lead to phenotype?

### Notes:

1. *Worksheets are on the following pages.*
2. *Students can draw a picture of the resulting child or write a description. Because the parents are famous, some classes have chosen to write a birth announcement for a magazine.*
3. *This package does not include celebrities for mating or the final sheet to draw the child or describe the offspring in a birth announcement. If you would like these extra sheets, please contact [gened@genomebc.ca](mailto:gened@genomebc.ca).*

## Star Crossings

**Purpose:** To introduce the basic mechanisms by which genetic traits are inherited.

We will assign genotypes and phenotypes to our mating pairs. These genotypes will be combined to create offspring with a unique combination of traits from the parents.

**Materials:** Star Crossings worksheets, beaker, scissors, pencil, coloured pens/pencils for drawing

**Procedure:**

1. Meet your partner at your station. Receive two pictures of “stars” from the instructors. You will be “crossing” these two stars to create a beaker baby!
2. Based on phenotypes (*what we see*), figure out the genotypes (*underlying genes*) of your star. Do this by circling the appropriate phenotype for each trait in **Table 1 (Personal Traits and Genotypes)**. See the example here:

Trait				Genotype (case sensitive)
B. Hair colour	Black = BB	Brown/red = Bb	Blonde = bb	B b
X. Sex	Female = XX	Male = XY		X X

3. Now write the corresponding alleles (one letter per box) in **Table 2 (Alleles)**. Put the female alleles on the yellow paper and the male alleles on the green paper. Example:

Trait	Genotype	
	Allele 1	Allele 2
B. Hair colour	B	B
X. Sex	X	X

4. From **Table 2** cut out each allele for each trait. Place all of the individual alleles for male and for female into the beaker.
5. **Shake the beaker to mix all of the alleles!** Randomly draw out yellow and green alleles from the beaker so that you create complete genotypes for each trait. Remember: Each trait needs an allele from “mom” and an allele from “dad”. **If you draw a repeat allele, use only the first allele drawn for that trait to form your gamete.**
6. As you draw out alleles, write them in the Genotype 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 phenotype column of **Table 3**.
8. Draw a detailed picture of the resulting offspring with the appropriate traits based on his or her genotype. Be certain to use arrows and clearly label all 12 traits of your offspring. OR: You can write a birth announcement that describes the various traits.

**Table 1 - Traits and Genotypes of your “star”**

Circle the phenotype and write the genotype for your star. Then transfer the alleles to Table 2 for cutting.

Trait (Phenotype)				Genotype (case sensitive)
<b>X. Sex</b>	XX = female	XY=male		
<b>B. Hair color</b>	BB = black	Bb = brown/red	bb = blond	
<b>C. Hair curl</b>	CC = curly	Cc = wavy	cc = straight	
<b>D. Dimples</b>	DD = present	Dd = present	dd = absent	
<b>E. Eye color</b>	EE = brownish	Ee = greenish	ee = blue	
<b>F. Earlobes</b>	FF = free	Ff = free	ff = attached	
<b>H. Hair on mid-finger</b>	HH = with hair	Hh = with hair	hh = no hair	
<b>L. Longer 2<sup>nd</sup> toe than big toe</b>	LL = long	Ll = long	ll = short	
<b>N. Nose</b>	NN = convex	Nn = convex	nn = straight or concave	
<b>P. Hair line</b>	PP = widow's peak	Pp = widow's peak	pp = straight	
<b>R. Tongue roll</b>	RR = roller	Rr = roller	rr = non-roller	
<b>T. Thumb</b>	TT = bent back	Tt = bent back	tt = straight	

**\*\*Please choose one option for traits that have two possibilities for genotype (e.g. able to roll tongue can be RR or Rr).**

**\*\*For the traits that you can't see on your 'star', just make one up! Or use your own traits!\*\***

**Table 2 – Personal traits – Alleles separated for your “star”**

Trait	Genotype*	
	Allele 1	Allele 2
X. Sex		
B. Hair color		
C. Hair curl		
D. Dimples		
E. Eye color		
F. Earlobe		
H. Hair on mid-finger		
L. Longer 2 <sup>nd</sup> toe than big toe		
N. Nose		
P. Hair line		
R. Tongue roll		
T. Thumb		

*\*After you have completed the Genotype columns, cut along the dashed lines*

**Table 3 - The Child's Genetic Make-Up**

Trait	Genotype		Phenotype
	Male	Female	
X. Sex			
B. Hair color			
C. Hair curl			
D. Dimples			
E. Eye color			
F. Earlobe			
H. Hair on mid-finger			
L. Longer 2 <sup>nd</sup> toe than big toe			
N. Nose			
P. Hair line			
R. Tongue roll			
T. Thumb			

