

Student's Name \_\_\_\_\_ Date \_\_\_\_\_ Class \_\_\_\_\_

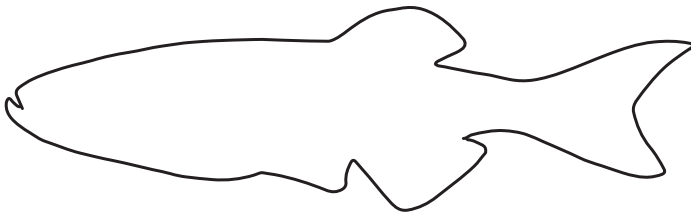
## Student Sheet 1.1: KWL Chart

Topic: \_\_\_\_\_

<b>K</b>	<b>W</b>	<b>L</b>
<b>What do you <u>K</u>now?</b>	<b>What do you <u>W</u>ant to know?</b>	<b>What did you <u>L</u>earn?</b>

### Student Sheet 1.4 Zebrafish Variation

#### Zebrafish



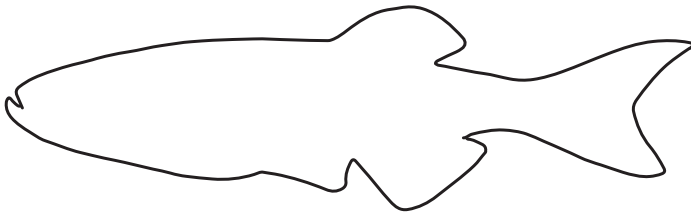
#### Description

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#### Casper Fish™



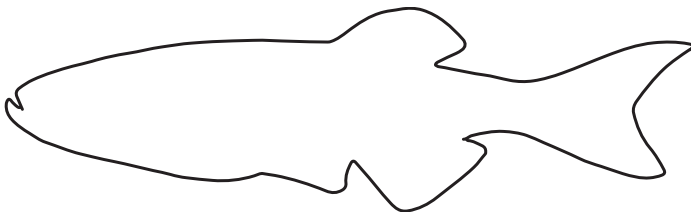
#### Description

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#### GloFish®



#### Description

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How are the zebrafish similar to and different from the other zebrafish?

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How are the zebrafish similar to or different from the Casper Fish™ and GloFish®?

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How are the Casper Fish similar to and different from the other Casper Fish?

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How are the Casper Fish similar to or different from the zebrafish and GloFish?

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How are the GloFish similar to and different from the other GloFish?

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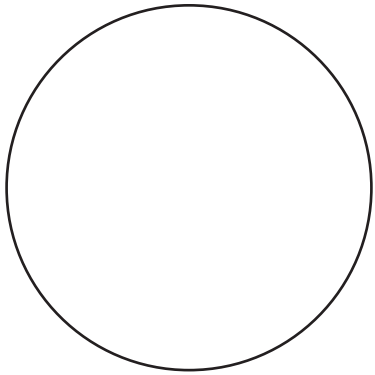
How are the GloFish similar to or different from the zebrafish and Casper Fish?

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**Student Sheet 2.3: Exploring Cell Types** (page 1 of 2)

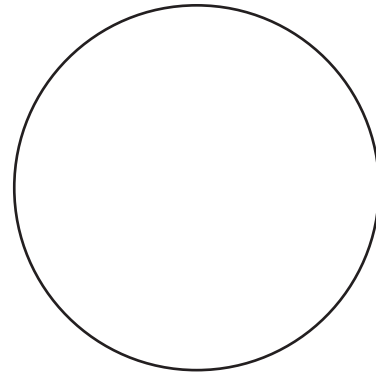


Proposed function: \_\_\_\_\_

Name of slide: \_\_\_\_\_

Answer to questions: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

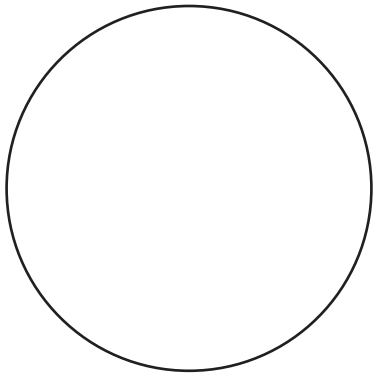


Proposed function: \_\_\_\_\_

Name of slide: \_\_\_\_\_

Answer to questions: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

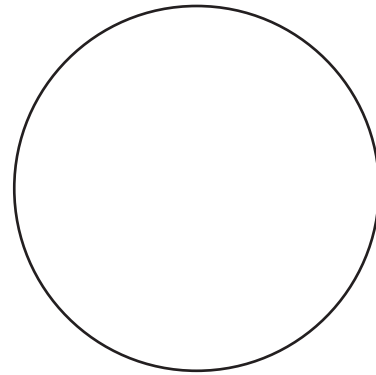


Proposed function: \_\_\_\_\_

Name of slide: \_\_\_\_\_

Answer to questions: \_\_\_\_\_

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\_\_\_\_\_  
\_\_\_\_\_



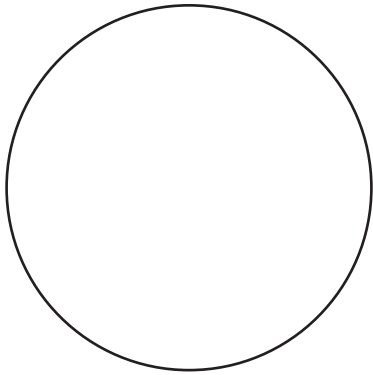
Proposed function: \_\_\_\_\_

Name of slide: \_\_\_\_\_

Answer to questions: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

### Student Sheet 2.3: Exploring Cell Types (page 2 of 2)

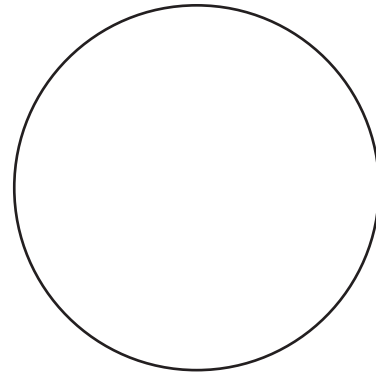


Proposed function: \_\_\_\_\_

Name of slide: \_\_\_\_\_

Answer to questions: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

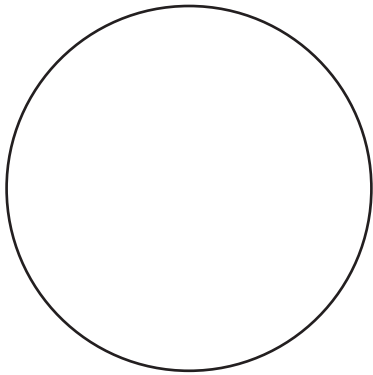


Proposed function: \_\_\_\_\_

Name of slide: \_\_\_\_\_

Answer to questions: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

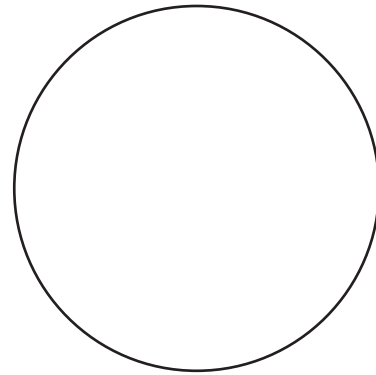


Proposed function: \_\_\_\_\_

Name of slide: \_\_\_\_\_

Answer to questions: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_



Proposed function: \_\_\_\_\_

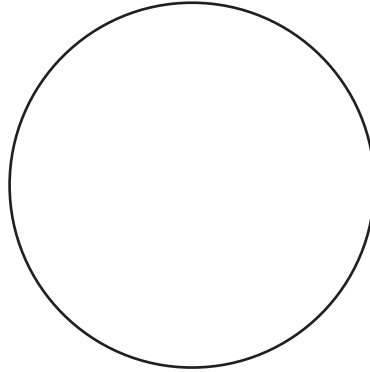
Name of slide: \_\_\_\_\_

Answer to questions: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

### Student Sheet 4.1: Onion Root Tip Investigation (page 1 of 2)

1. Observe all the cells squashed on your slide. Pay special attention to the dark, squiggly chromosomes inside each cell. Sketch what you see in your field of vision in the space below.



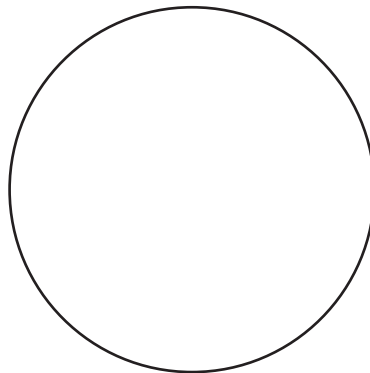
2. After making your initial observations, what do you notice about the chromosomes in these root cells?

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3. Trade microscopes with another group and observe their slide. Sketch what you observed in their field of vision in the space below.



4. Were the chromosomes in these cells similar to the ones you viewed on your own slide?

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### Student Sheet 4.1: Onion Root Tip Investigation (page 2 of 2)

5. Trade microscopes with two other groups. Compare your slide with theirs. Do you notice any similarities? Do you notice any differences? Describe your observations in the space below.

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6. Based on your observations, what do the chromosomes appear to be doing in these cells?

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7. What steps or process does a cell appear to go through to make more cells?

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8. Why do you think we used the root tips of the onion bulblet instead of the onion epidermis to view cell division for this investigation?

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### Student Sheet 4.3: Examining Meiosis (page 1 of 2)

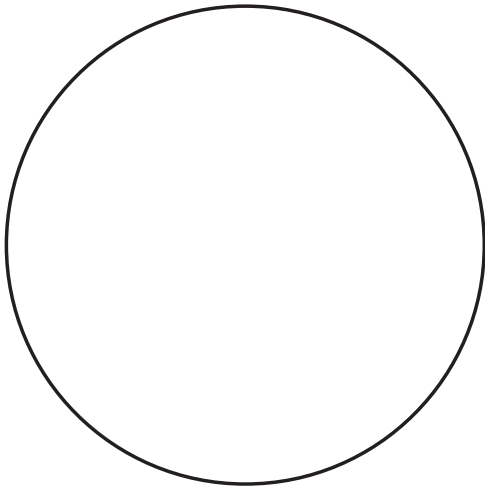
1. Meiosis is the division of sex cells, or sperm and eggs. Based on what you have already learned about cell division, what are some things that a cell must do before it can divide?

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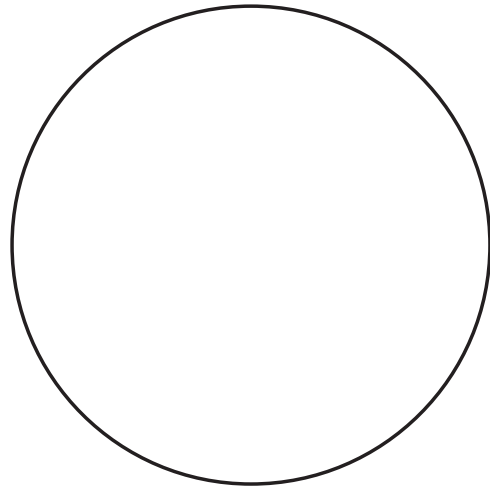
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**Directions:** With your partner, attend each microscope station and briefly discuss and then sketch what you see below. Be sure to sketch each slide under the correct box. Check your station number each time you rotate.

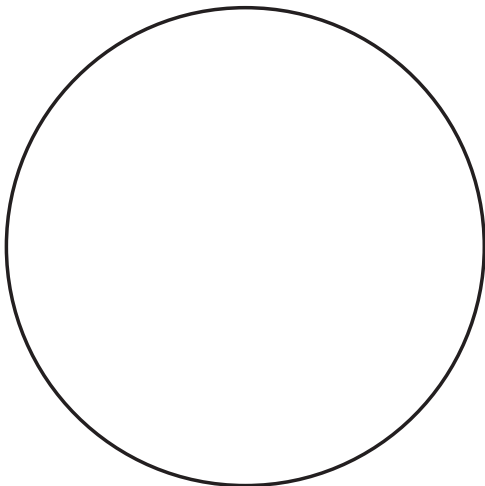
**Microscope 1**



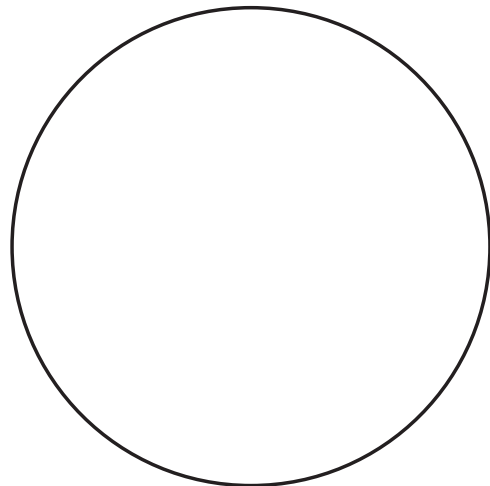
**Microscope 2**



**Microscope 3**



**Microscope 4**



**Student Sheet 4.3: Examining Meiosis** (page 2 of 2)

**2.** Compare these stages to the stages that occur during mitosis. What are some similarities you have noticed between mitosis and meiosis?

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**3.** What is a major difference that you observed between mitosis and meiosis?

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**4.** Using your prior knowledge, how would you arrange the microscope slides to display meiosis? Start from what you believe would be the beginning microscope slide and work your way toward what you believe would be the last slide. List the order in which you put the microscopes below.

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**Student Sheet 5.2a: Create a Creature** (page 1 of 2)

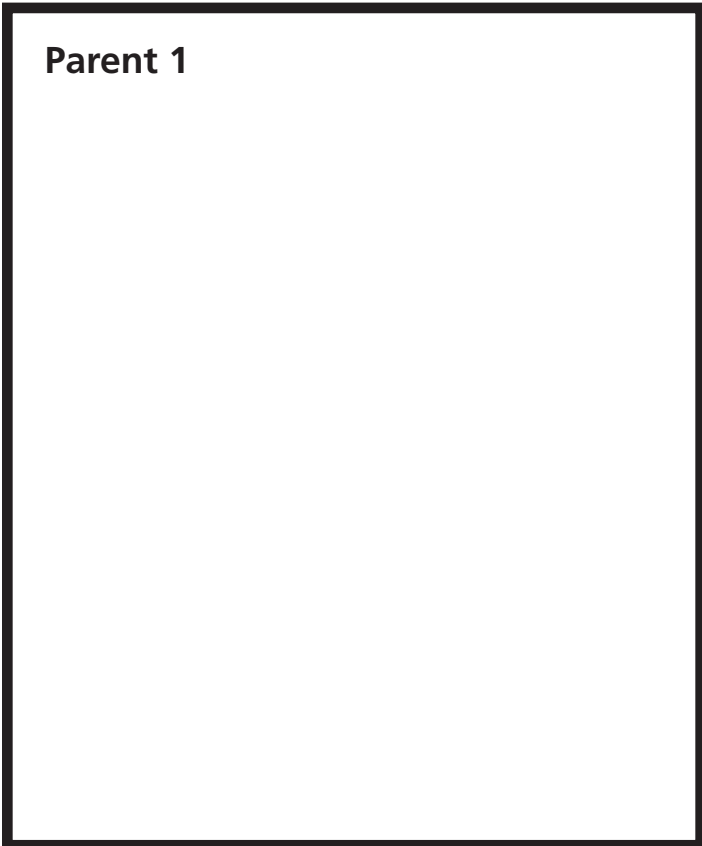
<b>Creature 1: Mother</b>							
<b>Trait</b>	<b>Dominant Allele</b>	<b>Recessive Allele</b>	<b>Allele 1</b>	<b>Allele 2</b>	<b>Genotype</b>	<b>Homozygous Recessive, Heterozygous, Homozygous Dominant</b>	<b>Phenotype</b>
<b>Fur Length</b>	Long (L)	Short (l)					
<b>Fur Color</b>	Green (G)	Blue (g)					
<b>Eye Color</b>	Purple (P)	Blue (p)					
<b>Horn Shape</b>	Curved (C)	Straight (c)					
<b>Wing Shape</b>	Dragonfly (D)	Butterfly (d)					
<b>Wing Color</b>	Purple (R)	Red (r)					
<b>Feet</b>	Not webbed (W)	Webbed (w)					
<b>Height</b>	Tall (H)	Short (h)					
<b>Teeth</b>	Pointed (T)	Blunt (t)					

**Student Sheet 5.2a: Create a Creature** (page 2 of 2)

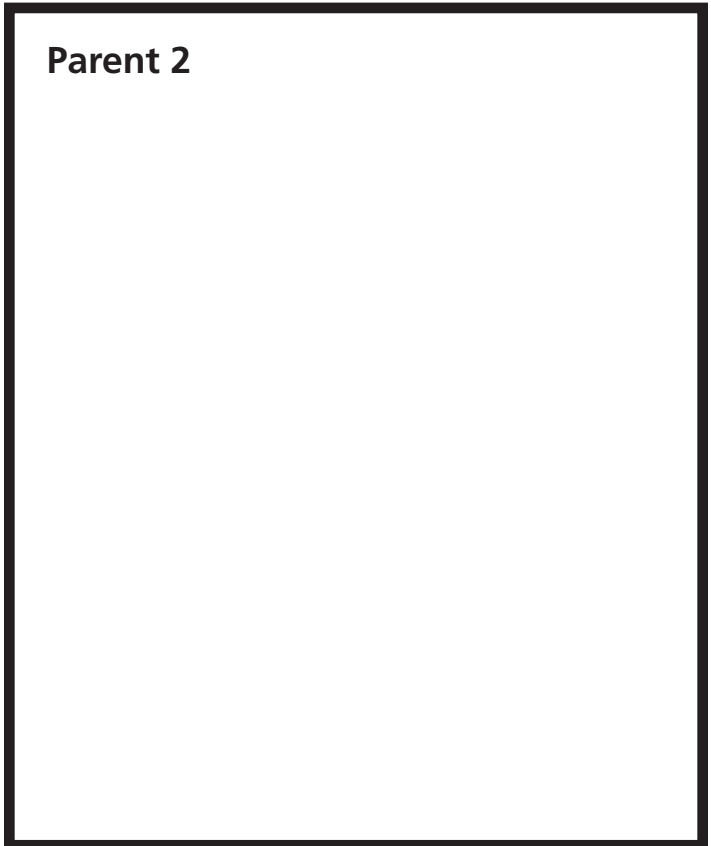
<b>Creature 1: Father</b>							
<b>Trait</b>	<b>Dominant Allele</b>	<b>Recessive Allele</b>	<b>Allele 1</b>	<b>Allele 2</b>	<b>Genotype</b>	<b>Homozygous Recessive, Heterozygous, Homozygous Dominant</b>	<b>Phenotype</b>
<b>Fur Length</b>	Long (L)	Short (l)					
<b>Fur Color</b>	Green (G)	Blue (g)					
<b>Eye Color</b>	Purple (P)	Blue (p)					
<b>Horn Shape</b>	Curved (C)	Straight (c)					
<b>Wing Shape</b>	Dragonfly (D)	Butterfly (d)					
<b>Wing Color</b>	Purple (R)	Red (r)					
<b>Feet</b>	Not webbed (W)	Webbed (w)					
<b>Height</b>	Tall (H)	Short (h)					
<b>Teeth</b>	Pointed (T)	Blunt (t)					

## Student Sheet 5.2b: Create a Creature Mat

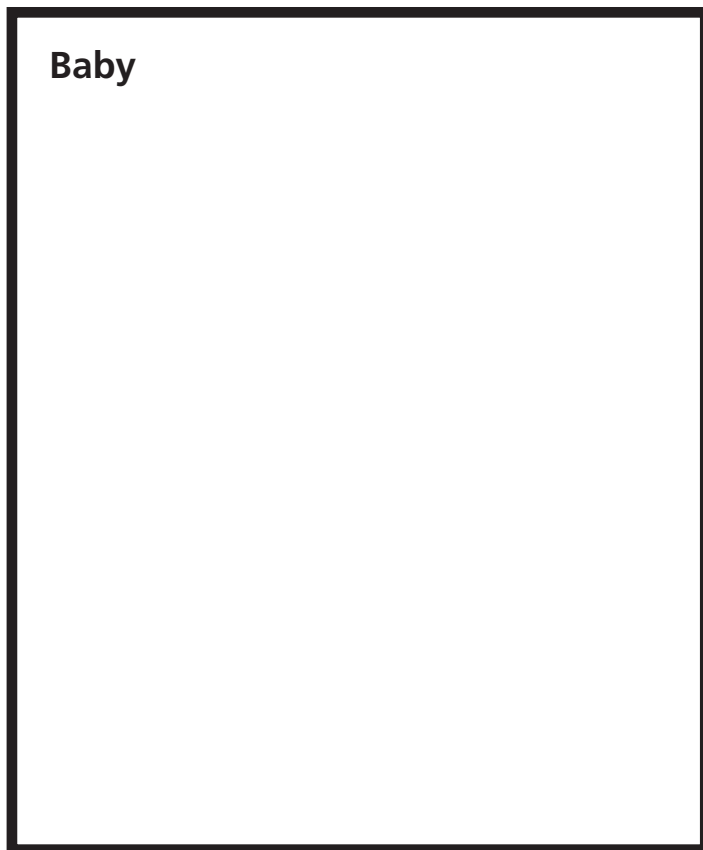
**Parent 1**



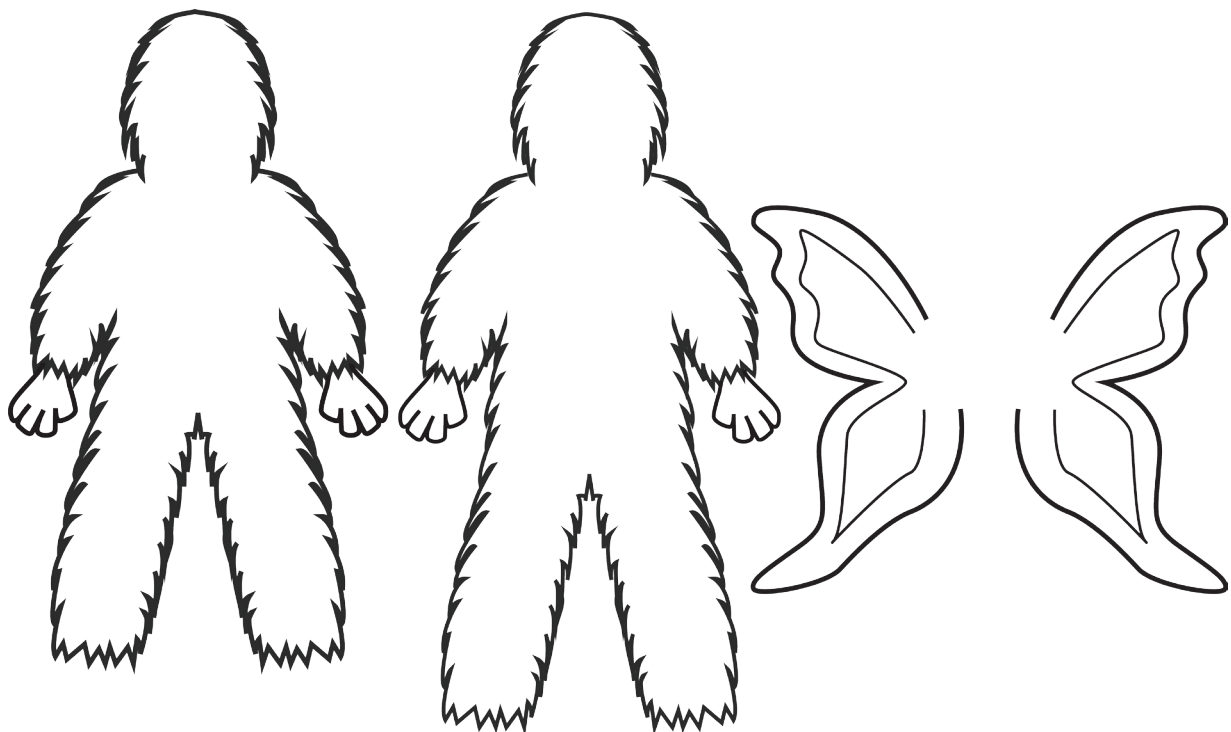
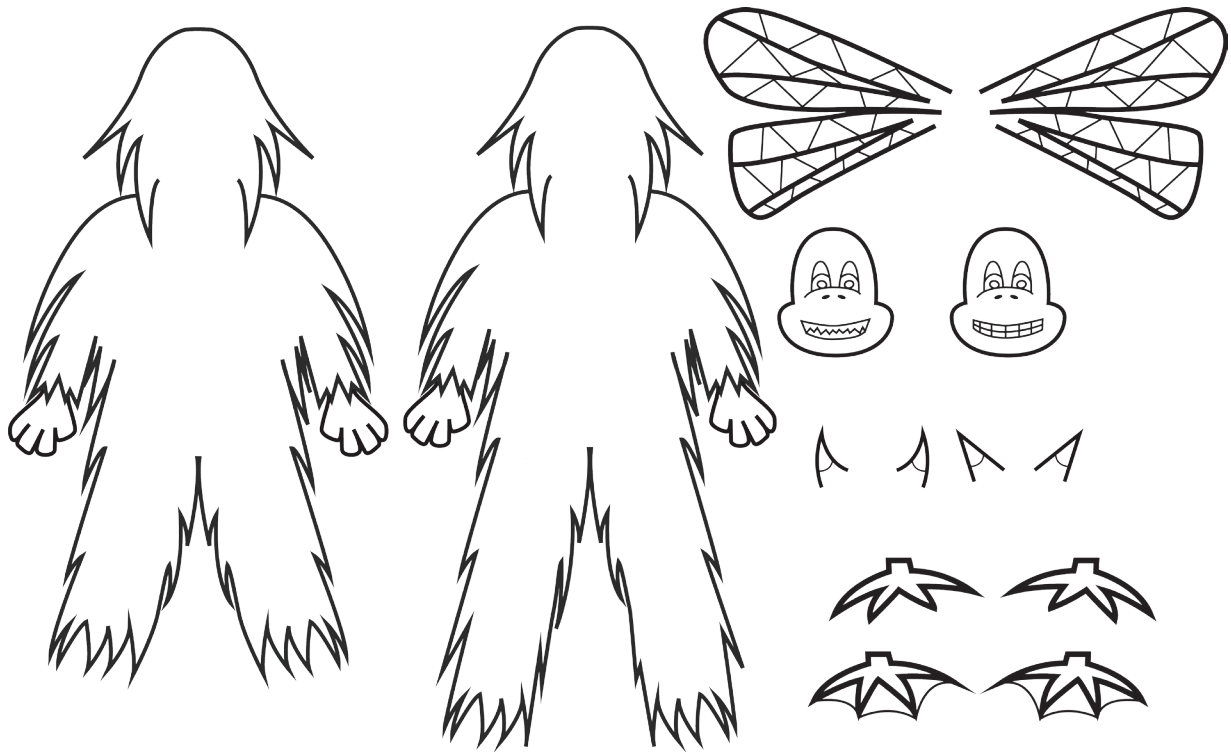
**Parent 2**



**Baby**



### Student Sheet 5.2c: Creature Template



### Student Sheet 5.3: Creature Babies

<b>Table 1. Parental Information</b>				
	<b>Mother</b>		<b>Father</b>	
<b>Trait</b>	<b>Allele 1</b>	<b>Allele 2</b>	<b>Allele 1</b>	<b>Allele 2</b>
<b>Fur Length</b>				
<b>Fur Color</b>				
<b>Eye Color</b>				
<b>Horn Shape</b>				
<b>Wing Shape</b>				
<b>Wing Color</b>				
<b>Feet</b>				
<b>Height</b>				
<b>Teeth</b>				

<b>Table 2. Offspring Information</b>							
<b>Trait</b>	<b>Dominant Allele</b>	<b>Recessive Allele</b>	<b>Allele 1 (from mother)</b>	<b>Allele 2 (from father)</b>	<b>Genotype</b>	<b>Homozygous Recessive, Heterozygous, Homozygous Dominant</b>	<b>Phenotype</b>
<b>Fur Length</b>	Long (L)	Short (l)					
<b>Fur Color</b>	Green (G)	Blue (g)					
<b>Eye Color</b>	Purple (P)	Blue (p)					
<b>Horn Shape</b>	Curved (C)	Straight (c)					
<b>Wing Shape</b>	Dragonfly (D)	Butterfly (d)					
<b>Wing Color</b>	Purple (R)	Red (r)					
<b>Feet</b>	Webbed (W)	Not Webbed (w)					
<b>Height</b>	Tall (H)	Short (h)					
<b>Teeth</b>	Pointed (T)	Blunt (t)					

### Student Sheet 5.4: Creature Punnett Squares

Maternal Phenotype: \_\_\_\_\_ Maternal Genotype: \_\_\_\_\_

Maternal Allele 1: \_\_\_\_\_ Maternal Allele 2: \_\_\_\_\_

Paternal Phenotype: \_\_\_\_\_ Paternal Genotype: \_\_\_\_\_

Paternal Allele 1: \_\_\_\_\_ Paternal Allele 2: \_\_\_\_\_

		Mother	
		Allele 1 _____	Allele 1 _____
Father	Allele 1 _____		
	Allele 2 _____		

Maternal Phenotype: \_\_\_\_\_ Maternal Genotype: \_\_\_\_\_

Maternal Allele 1: \_\_\_\_\_ Maternal Allele 2: \_\_\_\_\_

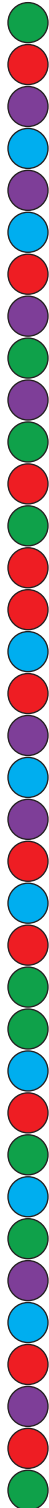
Paternal Phenotype: \_\_\_\_\_ Paternal Genotype: \_\_\_\_\_

Paternal Allele 1: \_\_\_\_\_ Paternal Allele 2: \_\_\_\_\_

		Mother	
		Allele 1 _____	Allele 1 _____
Father	Allele 1 _____		
	Allele 2 _____		

### Student Sheet 6.2: It's All in the Strand

**DNA**



**RNA**



**Proteins** (Amino Acid Sequence)



### Student Sheet 6.3: Changes to the Strand

<b>Table 1.</b>			
	DNA	RNA	Protein (Amino Acid Sequence)
1	○ ○ ○ ○ ○ ○ ○ ○ ○ ○	○ ○ ○ ○ ○ ○ ○ ○ ○ ○	
2	○ ○ ○ ○ ○ ○ ○ ○ ○ ○	○ ○ ○ ○ ○ ○ ○ ○ ○ ○	
3	○ ○ ○ ○ ○ ○ ○ ○ ○ ○	○ ○ ○ ○ ○ ○ ○ ○ ○ ○	

<b>Table 2.</b>			
	DNA	RNA	Protein (Amino Acid Sequence)
1	○ ○ ○ ○ ○ ○ ○ ○ ○ ○	○ ○ ○ ○ ○ ○ ○ ○ ○ ○	
2	○ ○ ○ ○ ○ ○ ○ ○ ○ ○	○ ○ ○ ○ ○ ○ ○ ○ ○ ○	
3	○ ○ ○ ○ ○ ○ ○ ○ ○ ○	○ ○ ○ ○ ○ ○ ○ ○ ○ ○	



**Student Sheet 8.3: Fast Plants® Punnett Squares** (page 1 of 2)

Cross 1: Heterozygous Parent × Heterozygous Parent

Genotype Parent 1: \_\_\_\_\_

Genotype Parent 2: \_\_\_\_\_

		Parent 1	
		Allele 1 _____	Allele 1 _____
Parent 2	Allele 1 _____		
	Allele 2 _____		

Cross 2: Homozygous Recessive Parent × Homozygous Dominant Parent

Genotype Parent 1: \_\_\_\_\_

Genotype Parent 2: \_\_\_\_\_

		Parent 1	
		Allele 1 _____	Allele 1 _____
Parent 2	Allele 1 _____		
	Allele 2 _____		

**Student Sheet 8.3: Fast Plants® Punnett Squares** (page 2 of 2)

Cross 3: Homozygous Recessive Parent × Homozygous Recessive Parent

Genotype Parent 1: \_\_\_\_\_

Genotype Parent 2: \_\_\_\_\_

		Parent 1	
		Allele 1 _____	Allele 1 _____
Parent 2	Allele 1 _____		
	Allele 2 _____		

Cross 4: Homozygous Dominant Parent × Homozygous Dominant Parent

Genotype Parent 1: \_\_\_\_\_

Genotype Parent 2: \_\_\_\_\_

		Parent 1	
		Allele 1 _____	Allele 1 _____
Parent 2	Allele 1 _____		
	Allele 2 _____		

### Student Sheet 8.4: Diversity in a Population

<b>Table 1. Population 1</b>			
<b>Generation</b>	<b>Number of Parents</b>	<b>Number of Offspring</b>	<b>Total Number of Individuals</b>
<b>1</b>			
<b>2</b>			
<b>3</b>			
<b>4</b>			
<b>5</b>			
<b>6</b>			

<b>Table 2. Population 2</b>				
<b>Generation</b>	<b>Number of Parents</b>	<b>Number of Reproductive Pairs</b>	<b>Number of Offspring</b>	<b>Total Number of Individuals</b>
<b>1</b>				
<b>2</b>				
<b>3</b>				
<b>4</b>				
<b>5</b>				
<b>6</b>				

**Student Sheet 9.1: Natural Selection** (page 1 of 3)

**Habitat Map 1**

<b>Table 9.1.</b>		<b>Initial Number</b>	<b>Number Captured</b>	<b>Number Remaining</b>	<b>Number of Offspring</b>	<b>Number for the Next Generation</b>
<b>Generation 1</b>	Blue	30				
	Green	30				
	Red	30				
	Yellow	30				
<b>Generation 2</b>	Blue					
	Green					
	Red					
	Yellow					
<b>Generation 3</b>	Blue					
	Green					
	Red					
	Yellow					
<b>Generation 4</b>	Blue					
	Green					
	Red					
	Yellow					
<b>Generation 5</b>	Blue					
	Green					
	Red					
	Yellow					

### Student Sheet 9.1: Natural Selection (page 2 of 3)

#### Habitat Map 2

**Table 9.2.**

		<b>Initial Number</b>	<b>Number Captured</b>	<b>Number Remaining</b>	<b>Number of Offspring</b>	<b>Number for the Next Generation</b>
<b>Generation 1</b>	Blue	30				
	Green	30				
	Red	30				
	Yellow	30				
<b>Generation 2</b>	Blue					
	Green					
	Red					
	Yellow					
<b>Generation 3</b>	Blue					
	Green					
	Red					
	Yellow					
<b>Generation 4</b>	Blue					
	Green					
	Red					
	Yellow					
<b>Generation 5</b>	Blue					
	Green					
	Red					
	Yellow					

**Student Sheet 9.1: Natural Selection** (page 3 of 3)

**Habitat Map 3**

**Table 9.3.**

		<b>Initial Number</b>	<b>Number Captured</b>	<b>Number Remaining</b>	<b>Number of Offspring</b>	<b>Number for the Next Generation</b>
<b>Generation 1</b>	Blue	30				
	Green	30				
	Red	30				
	Yellow	30				
<b>Generation 2</b>	Blue					
	Green					
	Red					
	Yellow					
<b>Generation 3</b>	Blue					
	Green					
	Red					
	Yellow					
<b>Generation 4</b>	Blue					
	Green					
	Red					
	Yellow					
<b>Generation 5</b>	Blue					
	Green					
	Red					
	Yellow					

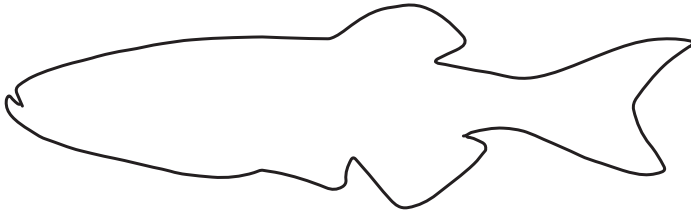
### Student Sheet 9.2: Artificial Selection

**Table 9.4.**

		<b>Initial Number</b>	<b>Number Captured</b>	<b>Number Remaining</b>	<b>Number of Offspring</b>	<b>Number for the Next Generation</b>
<b>Generation 1</b>	Blue	30				
	Green	30				
	Red	30				
	Yellow	30				
<b>Generation 2</b>	Blue					
	Green					
	Red					
	Yellow					
<b>Generation 3</b>	Blue					
	Green					
	Red					
	Yellow					
<b>Generation 4</b>	Blue					
	Green					
	Red					
	Yellow					
<b>Generation 5</b>	Blue					
	Green					
	Red					
	Yellow					

### Student Sheet 10.1: Zebrafish Variations

#### Zebrafish



#### Description

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How are the zebrafish similar to and different from the other zebrafish?

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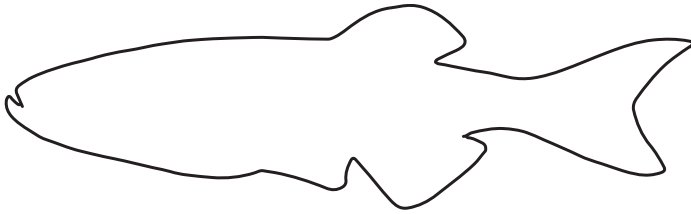
How are the zebrafish similar to or different from the Casper Fish and GloFish?

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#### Casper Fish™



#### Description

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How are the Casper Fish similar to and different from the other Casper Fish?

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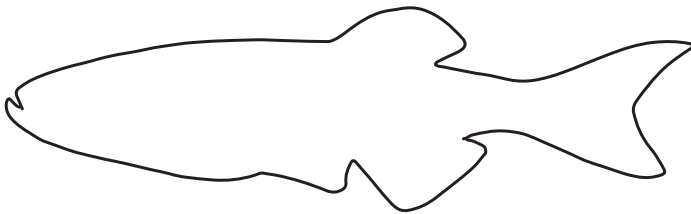
How are the Casper Fish similar to or different from the zebrafish and GloFish?

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#### GloFish®



#### Description

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How are the GloFish similar to and different from the other GloFish?

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How are the GloFish similar to or different from the zebrafish and Casper Fish?

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Student's Name \_\_\_\_\_ Date \_\_\_\_\_ Class \_\_\_\_\_

## Student Sheet 10.2: Genetic Manipulation Research (page 1 of 3)

Method: \_\_\_\_\_

\_\_\_\_\_

Description: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Resource 1: \_\_\_\_\_

\_\_\_\_\_

Resource 2: \_\_\_\_\_

\_\_\_\_\_

Resource 3: \_\_\_\_\_

\_\_\_\_\_

Method: \_\_\_\_\_

\_\_\_\_\_

Description: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Resource 1: \_\_\_\_\_

\_\_\_\_\_

Resource 2: \_\_\_\_\_

\_\_\_\_\_

Resource 3: \_\_\_\_\_

\_\_\_\_\_

Student's Name \_\_\_\_\_ Date \_\_\_\_\_ Class \_\_\_\_\_

## Student Sheet 10.2: Genetic Manipulation Research (page 2 of 3)

Method: \_\_\_\_\_

Description: \_\_\_\_\_

Resource 1: \_\_\_\_\_

Resource 2: \_\_\_\_\_

Resource 3: \_\_\_\_\_

Method: \_\_\_\_\_

Description: \_\_\_\_\_

Resource 1: \_\_\_\_\_

Resource 2: \_\_\_\_\_

Resource 3: \_\_\_\_\_

### Student Sheet 10.2: Genetic Manipulation Research (page 3 of 3)

Method: \_\_\_\_\_

Description: \_\_\_\_\_

Resource 1: \_\_\_\_\_

Resource 2: \_\_\_\_\_

Resource 3: \_\_\_\_\_

Method: \_\_\_\_\_

Description: \_\_\_\_\_

Resource 1: \_\_\_\_\_

Resource 2: \_\_\_\_\_

Resource 3: \_\_\_\_\_

**Student Sheet 11.WA: *Genes and Molecular Machines***  
**Written Assessment Answer Sheet** (page 1 of 2)

**Multiple Choice**

- |          |          |          |
|----------|----------|----------|
| 1. _____ | 3. _____ | 5. _____ |
| 2. _____ | 4. _____ | 6. _____ |

**Short Answer**

7. \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
8. \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
9. \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
10. \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
11. \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Student Sheet 11.WA: *Genes and Molecular Machines***  
**Written Assessment Answer Sheet (page 2 of 2)**

**12.** \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**13.** \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**14.** \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**15.** \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_