Name: _____ Row: _____

Date:_____ Period:_____

Mutant Dinosaur

Intro

Your dinosaur is born with a new genetic mutation. Your job is to map out the genes that are influenced by the mutation and to discover how the new dinosaurs interact with the environment using the principles of evolution.

Order of Progression

1. Dinosaur Background
2. Dinosaur Chromosome Mutation
3. Dinosaur Gene Mutation
4. Dinosaur Habitat Answer Sheet
5. Dinosaur Speciation Answer Sheet
6. Original Dinosaur and New Dinosaur Drawing
7. Short Answer Questions

Drawings

Draw a picture of the original dinosaur species and the mutated dinosaur species. Picture needs to be large in size, detailed, phenotypes labeled, colored, and titled.

mRNA Codon Table

1st Base	2nd Base: U	2nd Base: C	2nd Base: A	2nd Base: G	3rd Base
U	Phenylalanine	Serine	Tyrosine	Cysteine	U
	Phenylalanine	Serine	Tyrosine	Cysteine	C
	Leucine	Serine	Stop	Stop	A
	Leucine	Serine	Stop	Tryptophan	G
C	Leucine	Proline	Histidine	Arginine	U
	Leucine	Proline	Histidine	Arginine	C
	Leucine	Proline	Glutamine	Arginine	A
	Leucine	Proline	Glutamine	Arginine	G
A	Isoleucine	Threonine	Asparagine	Serine	U
	Isoleucine	Threonine	Asparagine	Serine	C
	Isoleucine	Threonine	Lysine	Arginine	A
	Methionine	Threonine	Lysine	Arginine	G
G	Valine	Alanine	Aspartic acid	Glycine	U
	Valine	Alanine	Aspartic acid	Glycine	C
	Valine	Alanine	Glutamic acid	Glycine	A
	Valine	Alanine	Glutamic acid	Glycine	G

Dinosaur Background

What is the scientific name of the original dinosaur? _____

What body part of the dinosaur is going to change? _____

What are you going to change about this body part? _____

What is the new name for your mutant dinosaur? _____

Explain the new trait's phenotype in detail (uses, benefits for survival, how does it work).

_____

_____

_____

_____

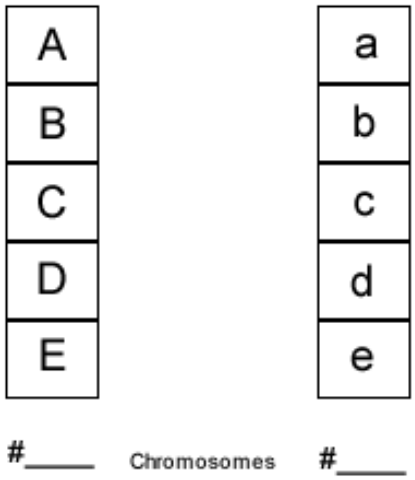
Chromosome Mutation

Pretend a single gene controls the body part above. This protein will cause a physical appearance change in the dinosaur. The physical change must be able to leave some skeletal or fossil evidence. *You are now going to create two mutations for this single gene.* The first type of mutation is called a chromosome mutation. You will cause this

mutation by manipulating the dinosaur's chromosomes. The second type of mutation on the following page is called a point mutation.

Create a mutation to a band (labeled A - E) on either of the chromosomes. Pretend the diploid number of chromosomes is 26. Which chromosome numbers did the mutation(s) happen on? _____ _____ Draw below the mutated chromosomes by mutating the bands (letters) and label the chromosome numbers..

Original Chromosomes



Mutated Chromosomes

Gene Mutation

Original Gene – make up original DNA sequence for the single-gene trait. Make sure there is no start or stop codons in the middle of your original DNA code (TAC, ATC, ATT, ACT).

Original Dinosaur DNA:

TAC /_____/_____/_____/_____/_____/_____/_____/_____/_____/_____/_____/_____/_____/_____/ ATT

mRNA:

_____/_____/_____/_____/_____/_____/_____/_____/_____/_____/_____/_____/_____/_____/_____/ UAA
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

Original Amino Acid Sequence Write the first three letters of the amino acid on each line.

_____ / _____ / _____ / _____ / _____ /
1 2 3 4 5

_____ / _____ / _____ / _____ / _____ /
6 7 8 9 10

_____ / _____ / _____ / _____ / _____
11 12 13 14 15

Mutated Gene - Mutated DNA (copy the DNA from above but mutate it by inserting, deleting or substituting one or more bases. Silent mutations are not allowed.) ***Circle*** the *mutation*.

Mutated DNA:

TAC /_____/_____/_____/_____/_____/_____/_____/_____/_____/_____/_____/_____/_____/_____/_____

mRNA:

_____/_____/_____/_____/_____/_____/_____/_____/_____/_____/_____/_____/_____/_____/_____
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

Mutated Amino Acid Sequence – ***Circle*** what has changed from the original amino acid sequence.

_____ / _____ / _____ / _____ / _____ /
1 2 3 4 5

_____ / _____ / _____ / _____ / _____ /
6 7 8 9 10

_____ / _____ / _____ / _____ / _____
11 12 13 14 15

Dinosaur Habitat

Please use the reference page with information about your dinosaur to help answer the following questions. Look at the reference of *Habitat* and *Diet* and compare to information on biomes in your textbook.

Current Habitat

What type of habitat would your dinosaur live in? _____

List abiotic factors (climate, landscape) found in this habitat.

_____

_____

List biotic factors (living things) found in this habitat. _____

_____

_____

What does your original dinosaur eat? _____

Does the diet change based upon the mutation? If yes, explain how your mutant dinosaur's diet is different than the original dinosaur's diet? _____

_____

_____

_____

Environmental Change

An environmental change is happening to the habitat your dinosaur lives in. In real life you can not choose your environmental change, but for this project pick one that your mutant dinosaur would be best adapted for. *Circle only one change* (one *).

* Cooling to an ice age
* Climate warming causing a lot more rain
* Rise of the sea level
* Climate warming causing a long severe drought
* Invasion of a new species that competes for resources with your dinosaur
* Earthquakes cause the flow of a large river to go right through your dinosaur's habitat
* Many volcanoes erupt and release toxic gasses in the middle and upper atmosphere during a 500 year period.
* Volcanic lava flows isolate your dinosaur's habitat from rest of population on the island.

Dinosaur Habitat

Please use the reference page with info about your dinosaur to help answer the following questions.

How is the dinosaur's water sources affected by the environmental change? How would the dinosaur's habitat be affected by this change to their water sources? _____

_____

_____

_____

_____

How is the dinosaur's shelter / nesting sites necessary to live and reproduce affected by the environmental change? How would the dinosaur be affected by this change to their shelter / nesting site? _____

_____

_____

How would the food chain of your dinosaur's ecosystem be affected by the environmental change? How is the dinosaur's prey and predators be affected by this change to their food chain? _____

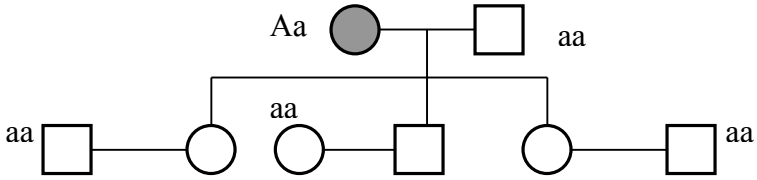
Some of the original dinosaurs do not survive the environmental change but your mutated dinosaur survives. Briefly explain why many of the original dinosaurs do not survive the environmental change. Make sure to use concepts like *adaptation* or *competition*.

Dinosaur Speciation

Now, based upon the dinosaur's habitat, the surviving dinosaurs will reproduce. Pretend the mutated gene created on Dinosaur Genetics page is **dominant** and causes your dinosaur to have genotype of **Aa**. Your mutant dinosaur is the shaded female in the pedigree below. Below is a pedigree showing how the mutant gene is passed on from generation to generation. The mate for your mutant dinosaur will have a genotype of **aa** because they represent original dinosaurs. Since you are demonstrating how adaptation leads to speciation, you need to follow the following four rules.
Rule 1: Half of the offspring that have the genotype **aa** die and don't reproduce.
Rule 2: All of the remaining offspring reproduce.
Rule 3: Label each of the organism's genotypes.
Rule 4: Design the pedigree go to the F3 generation and predict the F1000 generation.

F0

F1



F2

F3

F1000

What is the frequency of the mutated gene in the F1000 generation? _____%

What would the original and mutant dinosaur share in common? _____

Why did some of the recessive original dinosaurs die off above? _____

_____

In order for your mutant dinosaur population to become its own species, it needs to be separated from the original dinosaur population so they no longer will mate with each other. Come up with an idea of how the mutant dinosaur population uses reproductive isolation to separate itself from the original dinosaur population.

_____

_____

_____

_____

Short Answer Questions

Please write legibly, in complete sentences, answering each question using as much detail and evidence as possible. For each question, *do not give the definition.* Answer by applying a concept *using your dinosaur as an example***.**

1. Explain using your mutant dinosaur of how variation within a species increases the species chance that one variation will survive when the environment changes.

2. Your two fossil drawings show evidence on how one species is related to another species. Explain how the bone structures in the fossils and DNA provides evidence of a common ancestry between the original and mutant dinosaur.

3. Explain how natural selection acted on the mutant and original dinosaurs.

4. Explain how competition for resources affected your mutant dinosaur's fitness?

5. Explain how adaptation lead to speciation in regards to your dinosaur.

6. Pretend all the dinosaurs in this class make up a small community on an island. Explain why a larger number of different species increases the chance that at least some dinosaurs will survive a major change in the environment on the island.