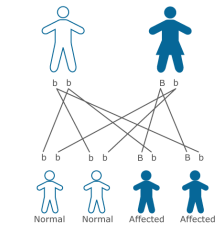
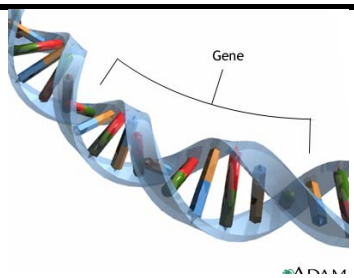
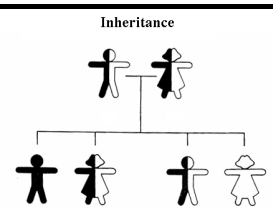
7th Grade Science – Quarter 3 (Part 1)

During this unit, you will learn about genetics. Here are some vocabulary words that may appear in this unit. We will also preview some of the information that you will learn in class.

	**Genetics** Def – the study of genes and how characteristics are passed down from one generation to the next. *Example – I have brown hair and brown eyes, just like my mom. It must be **genetic**.*
	**Genes** Def – segments (parts) of DNA that carry instructions for the traits you inherit *Example – I have brown eyes, just like my mom, but my brother has blue eyes, like our dad. He didn't get the "brown eye" **gene**.*
	DNA Def – material you inherit that a) controls all actvities of a cell; and b) contains the information to make new cells *Example – Lots of people in my family have diabetes. It's in our **DNA**.*
	**Inherit** Def – to receive from one's parents or family through genetics *Example – I **inherited** my good math skills from my mother.*
	Dominant Def – controling, stronger *Example – My mom has brown eyes, and my dad has blue. Nearly all of my brothers and sisters and I have brown eyes, so "brown eyes" must be the **dominant** gene.*

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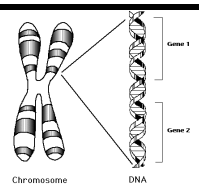
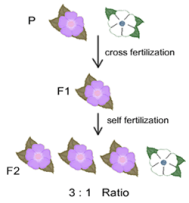
	Recessive Def – not strong *Example – My mom has brown eyes, and my dad has blue. My mom must have a **recessive** gene for blue eyes, though, because one of my brothers has blue eyes.*
	**Chromosome** Def – A coiled structure of DNA *Example – Some diseases are caused by missing or mutated **chromosomes**.*
	Trait Def – a unique quality that can be passed from one generation to the next *Example – Most guys in my dad's family are really tall. My brothers and I have this **trait**, too.*
	Environment Def – the area in which something exists or lives *Example – My **environment** is warm and sunny, but my cousin lives in an **environment** that is very snowy and cold.*
	Variation Def – Something that changes or is different from the normal state *Example – I usually have vanilla ice cream with chocolate sauce, but last night a tried a **variation** – vanilla ice cream with butterscotch.*
	Reproduction Def – the act of conceiving and having babies *Example – We learned about **reproduction** in health class.*
	**Artificial Selection** Def – the production of plants or animals by trying to include certain genes *Example – We wanted a pit bull-boxer mix, so we had to go to a dog **breeder**.*

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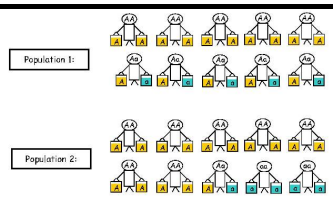
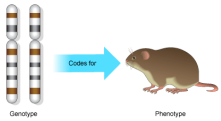
	Offspring Def – children, decendants *Example – Any children I have will be considered my "**offspring**."*
	**Genotype** Def – the genes that a parent gives to his/her offspring *Example – I inherited my **genotype** from both my parents.*
	**Phenotype** Def – how a person/organism looks – it results from a combination of the organism's genotype and its environment *Example – With my genotype, you would expect that I would be pale, but I spend a lot of time outdoors in the sun, so I'm actually tanner than both my parents. That tanned skin is in my **phenotype**.*

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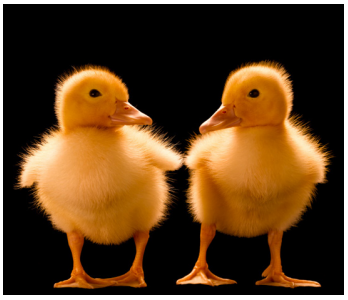
Here is a preview of what you will be learning in this unit. When you come to a word you do not know, look for it in the vocabulary chart. If it is not there or if you still do not understand the word or concept, ask your teacher!

GENETICS

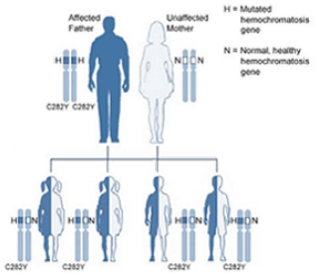
1. How are genes passed down from parent(s) to child(ren)?

Two possibilities:

a) The child gets ALL its genes from ONE parent.
   a. This is like a clone – the child will be the clone of the parent.



b) The child gets HALF its genes from one parent and HALF from the other
   a. This happens when there is a female & male parent (mom and dad), like humans and most animals.



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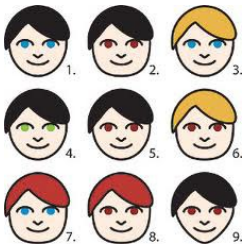
2. What are traits and how do you get your traits?

Traits are a distinguishing quality that can be passed from one generation to the next. Traits can be *inherited* or *acquired*. Your traits can be influenced by your genes and environment.

a) *Inherited traits*

Inherited traits are traits you inherit from your parents.

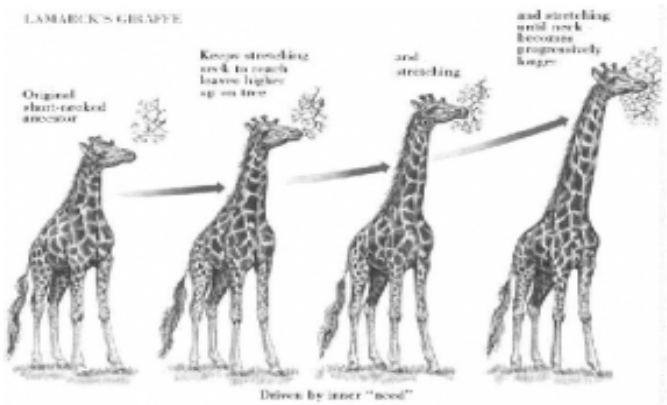
- eye color, shape of ear



b) *Acquired traits*

Acquired traits are traits that you acquire (or get) as you grow up, or over generations

- taillessness in mice, neck length in giraffes



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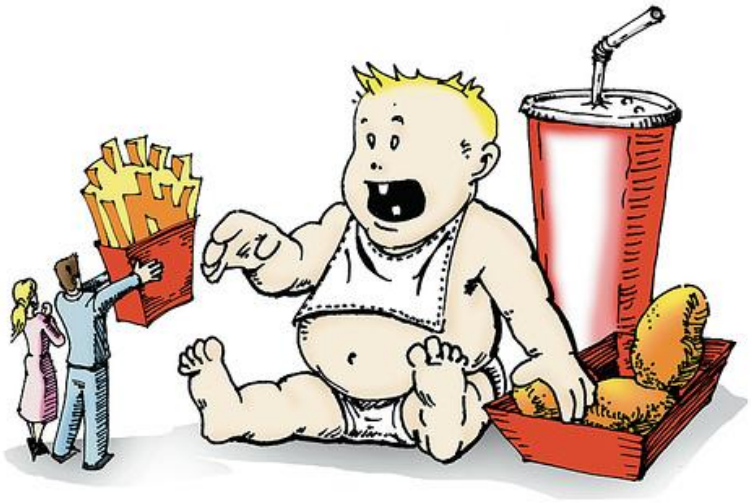
c) Genes/Environent

Some traits come from a combination of your genes and environment.

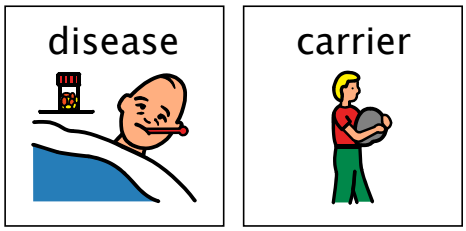
– height, weight

Ex: Your parents may be naturally slender thin, so you may have a *genetic* body size that is on the thin side, but if you eat a bunch of junk food in your *environment*, you may still end up fat.



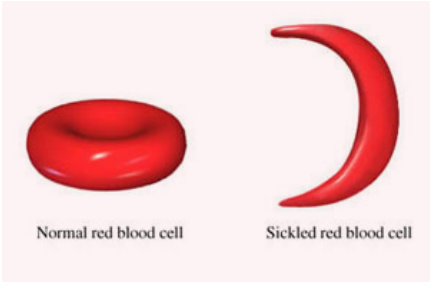
3. What are some diseases that you can inherit?

There are many diseases that you could inherit from your parents. Some diseases are *recessive*, meaning that you need a recessive gene from both parents in order to have the disease. If you inherit a recessive gene from only one parent, you are a *carrier*, but do not have the disease.



a) <u>Sickle Cell Anemia</u>

This is a ***genetic***, recessive disease that causes red blood cells to be shaped like a sickle, which mens they don't carry oxygen very well. 1 in 12 African Americans are carriers of one recessive gene for sickle cell, but they do not have the disease since they do not have both recessive genes for it.

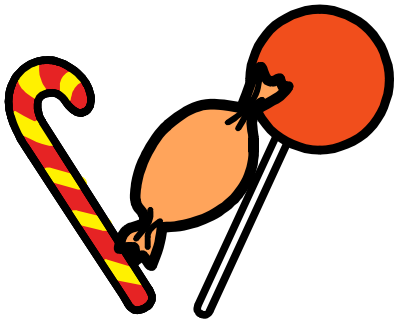


b) Cystic Fibrosis

This is a ***genetic***, recessive disease that causes the body to produce extremely thick mucus (body liquids, like snot) that can affect the lungs and pancreas (respiratory and digestive systems). 1 in 29 Caucasian Americans are carriers of one recessive gene for cystic fibrosis, but they do not have the disease since they do not have both recessive genes for it.

c) Type 1 Diabetes

Diabetes occurs when the pancreas cannot produce enough insulin to process the sugar in your blood. Type 1 Diabetes usually occurs in people who have a ***genetic*** predisposition for diabetes, but also have something in their ***environment*** that makes the disease occur (like a virus).

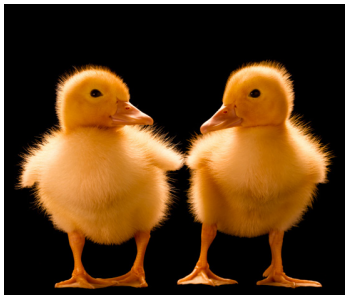


REPRODUCTION

Reproduction is the act of conceiving and having babies.
{Re [again] + produce [make] = make again}

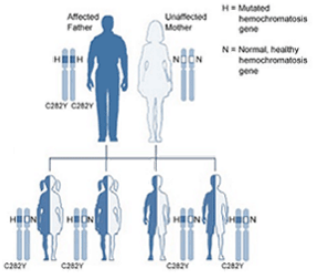
There are two ways that living creatures (everything from amoeba to humans) can reproduce.

1. **Asexual reproduction**
   Asexual reproduction occurs without interaction between two parents. Offspring (children) arise from a single parent and inherit the genes from that parent only.



   The offspring will receive traits from its parent – shape, color, etc. However, the *environment* may also influence it – size, etc.

2. **Sexual reproduction**
   Sexual reproduction occurs when there is a female and a male parent. The child gets HALF its genetic information from the female parent and HALF its genetic information from the male parent. This is how humans and most animals reproduce.



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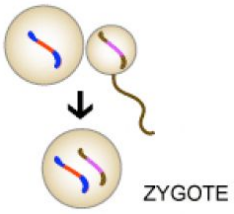
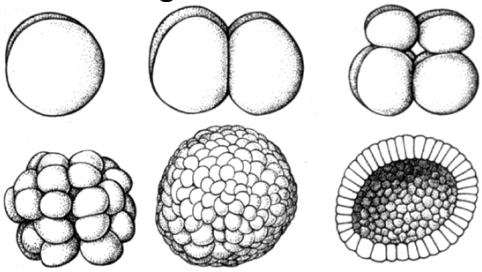
a. <u>Specialized Cells</u>
    i. Sexual reproduction needs a special cell from the female (egg) and a special cell from the male (sperm). These two cells combine to form a zygote.



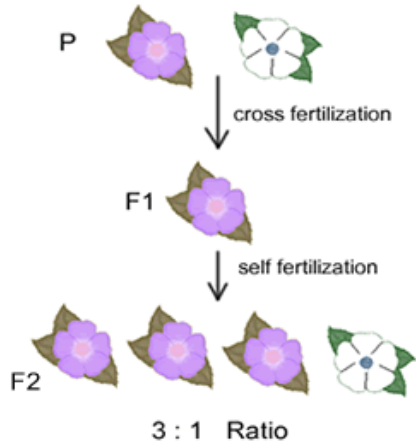
b. The zygote now has genetic information from both parents. It is going to split and copy itself over and over and over until there are 1 TRILLION cells to form a baby. Each cell has the same genetic information as the first one.



c. Sexual reproduction means that the children have greater variation (change). For example, even though you and your siblings may have the same parents, you do not all look the same. You each inherited a different combination of genes from your parents. Therefore, you are different from your parents and from your siblings.

BREEDING / ARTIFICIAL SELECTION

When you breed plants or animals, you try to make the plant or animal have certain traits. For example, you may want to produce white pansies or a dog with black spots.



In order to make the white flower, you need to know whether “white” is a dominant or recessive trait, and you need to make sure the parents have the right genes to pass on to the children.

When you breed different plants or animals, you can get new kinds of plants or animals. For example, if you breed a labrador and a poodle, you get a labrador-poodle mix – a labradoodle!

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PUNNETT SQUARES

Punnett squares are used to predict traits in offspring (children). They show how you inherit genes from your parents, as well as your chances of inheriting a certain gene from your parents.

D = Dominant gene
r = recessive gene
You need ONE dominant gene to show the dominant trait, but you need TWO recessive genes to show the recessive trait. Otherwise, you are just a carrier for the recessive gene.

DD = Two dominant genes → you show the dominant trait
rr = Two recessive genes → you show the recessive trait
Dr = One dominant gene & One recessive gene → you show the dominant trait, but are a carrier for the recessive trait

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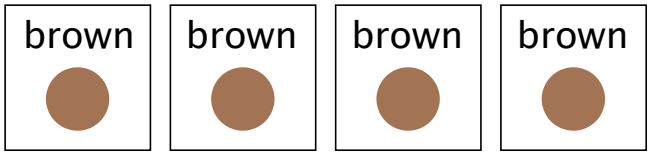
1. If *both* parents have two dominant genes, **ALL** (100%) of their offspring will show the dominant trait.

DD (parent 1) + DD (parent 2)

	D	D
D	DD	DD
D	DD	DD

Example: If both parents have brown eyes and both parents have two dominant genes for brown eyes (and no recessive genes for blue eyes), ALL of their children will have brown eyes. All of their children will also have two dominant genes for brown eyes, and NONE of them will be carriers for blue eyes.

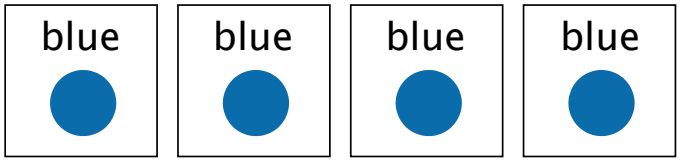


2. If *both* parents have two recessive genes, **ALL** (100%) of their offspring will show the recessive trait.

rr (parent 1) + rr (parent 2)

	r	r
r	rr	rr
r	rr	rr

Example: If both parents have blue eyes and both parents have two recessive genes for blue eyes (and no dominant genes for brown eyes), ALL of their children will have blue eyes. All of their children will also have two recessive genes for blue eyes.



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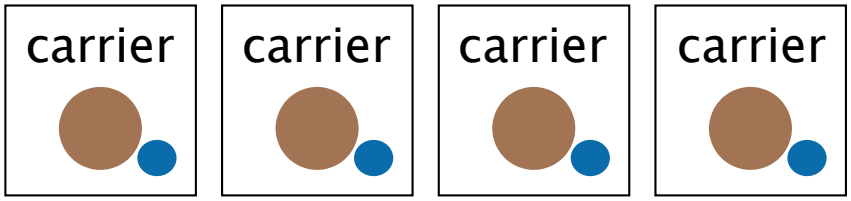
3. If one parent has two dominant genes and one parent has two recessive genes, **ALL** (100%) of the children will get one dominant gene and one recessive gene. **ALL** of the children will show the dominant trait, and **ALL** of the children will be carriers of the recessive trait.

DD (parent 1) + rr (parent 2)

	r	r
D	Dr	Dr
D	Dr	Dr

Example: If one parent has brown eyes (and has two dominant genes for brown eyes), and one parent has blue eyes (with two recessive genes for blue eyes), then ALL of the children will inherit one dominant gene for brown eyes and one recessive gene for blue eyes. ALL of the children will show the dominant trait for brown eyes, but ALL of the children will also be carriers for the recessive trait of blue eyes.

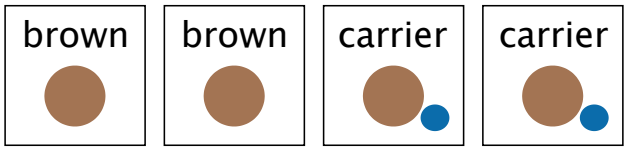


4. If one parent has two dominant genes, but one parent has one dominant gene and one recessive gene, then **ALL** (100%) of the children will show the dominant trait. However, their children have a **50% CHANCE** of being a *carrier* for the recessive gene.

DD (parent 1) + Dr (parent 2)

	D	r
D	DD	Dr
D	DD	Dr

Example: If both parents have brown eyes, but one parent has a recessive gene for blue eyes, then ALL of the children will inherit at least one dominant gene for brown. ALL of the children will show the dominant trait for brown eyes, but HALF (50%) of the children could be carriers for the recessive trait of blue eyes.

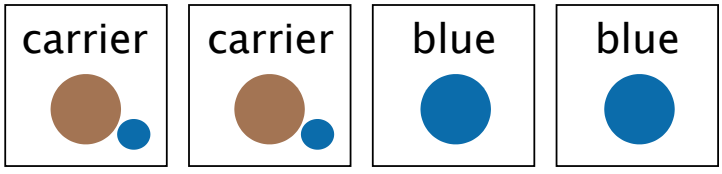


5. If one parent has two recessive genes, but one parent has one dominant and one recessive gene, their children have a **50% CHANCE** of showing the dominant trait and being a carrier of the recessive gene, and a **50% CHANCE** of showing the recessive trait.

Dr (parent 1) + rr (parent 2)

	r	r
D	Dr	Dr
r	rr	rr

Example: If one parent has brown eyes (but a recessive gene for blue eyes), and one parent has blue eyes, then HALF (50%) of their children may have brown eyes (and be carriers for blue eyes), and HALF (50%) of their children may show blue eyes.



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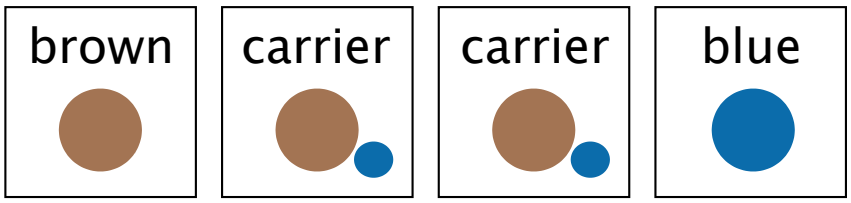
6. If both parents have one dominant and one recessive gene, their children have a **25% CHANCE** of showing the recessive trait, and a **50% CHANCE** of being a carrier for the recessive trait. They have a **75% CHANCE** of showing the dominant trait.

Dr (parent 1) + Dr (parent 2)

	D	r
D	DD	Dr
r	rD	rr

Example: If both parents have brown eyes, but both parents carry a recessive gene for blue eyes, then 25% of the children could have blue eyes. 75% of the children could have brown eyes. 50% of the children could be carriers for blue eyes.