

Heredity

4.4 Journal

Take a look at your physical traits or characteristics.

1. Do you have a cleft in your chin or no cleft?
2. Do you have dimples or no dimples?

No cleft in your chin and dimples are examples of dominant traits. What do you think a "dominant trait" is?

Dimples

Dimples (D) are dominant to no dimples (d). Dimples are recessive (dd) to the dominant (D) allele. A person has two alleles for a trait. One allele is dominant and the other is recessive.



Objectives

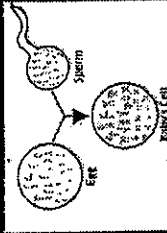
- Explain how genetic information passes from one generation to the next.
- Identify the causes of genetic disorders.
- Compare the role of genes, environment, and behavior in affecting a person's risk for disease.

The Basic Rules of Heredity

- **Heredity** - the passing on, or transmission, of biological traits from parent to child
- Eye color, shape of your ears, and height are examples of traits determined in part from genetic information inherited from your parents

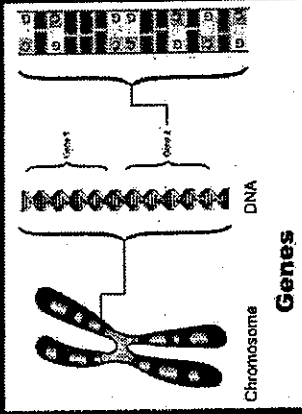
Chromosomes

- **Chromosomes**: tiny structures found within cells that carry information about the characteristics you will inherit
- Most of the cells in your body contain 23 pairs of chromosomes (46 total)
- Sex cells - sperm and egg - contain half
 - 23 chromosomes
 - When sperm and egg unite, the fertilized egg ends up with 46
 - 23 from each parent



Genes

- **Gene** - a section of a chromosome that determines or affects a characteristic, or trait
 - Genes come in pairs
 - Sex cells contain only one half of a gene pair
- You receive one gene copy from your father and one from your mother



Dominant and Recessive Traits

- A **dominant** trait is one that appears in an offspring whenever its gene is present
- A **recessive** trait appears in an offspring only when the dominant form is **not** present

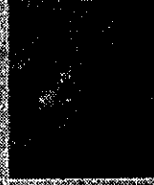
*The rules of heredity for most traits, such as height and eye color, are more complex because many different genes affect most traits.

For example...

Free Earlobes are dominant
Attached Earlobes are recessive



Detached Earlobes are dominant
Attached Earlobes are recessive



Characteristics you inherit from your parents (one from your mother)

Heredity and Disease

- **Genetic Disorders** are caused by the inheritance of an abnormal gene or chromosome
- Passed from parent to child like earlobe shape or eye color
- Recessive disorders - require 2 abnormal copies of the gene
- Dominant disorders - require just 1 abnormal copy of the gene
- Chromosomal disorders, such as Down syndrome, are a result of too few or too many chromosomes

Diseases with a Genetic Link

- Scientists know that a person's risk for many diseases increases when close relatives have the disease
- Genetic link suspected or identified in:
 - Breast cancer
 - Colon cancer
 - High blood pressure
 - Diabetes
 - Some forms of Alzheimer's disease

TABLE 11.5 COMMON AMONGSOME GENETIC DISORDERS

Disorder	Causes	Prevalence	Mode of Inheritance
Cystic fibrosis	Thick mucus in lungs, liver, and pancreas	17,500 (Caucasians)	Recessive
Sickle cell anemia	Poor blood circulation	1,000,000 (African Americans)	Recessive
Phenylketonuria	Defective enzyme (phenylalanine hydroxylase)	17,500 (All races)	Recessive
Hemophilia	Defective blood-clotting factor VIII	1,000,000 (Caucasians males)	Sex-linked recessive
Untersprung's disease	Production of an inhibitor of protein cell metabolism	17,500 (All races)	Dominant
Muscular dystrophy (Duchenne)	Impaired muscle activity	17,500 (males)	Sex-linked recessive
Congenital hypothyroidism	Increased birth weight, puffiness, constipation, lethargy	17,500 (All races)	Recessive
Hypercholesterolemia	Excessive cholesterol levels in blood, leading to heart disease	1,000 (African Americans)	Dominant

The Effect of Environment and Behavior

- For most diseases, your environment and your behavior affect your risk as much as or even more than your genes
- Determine risk factors that you can control and those that you cannot
- Example: Skin cancer runs in your family

Risk Factors You CAN Control	Risk Factors You CANNOT Control
<ul style="list-style-type: none"> • Unprotected or excessive exposure to the sun • Use of tanning beds • Sunburns 	<ul style="list-style-type: none"> • Fair complexion • Multiple or abnormal moles • Family history of skin cancer • Climate in which you live

Medical Advances

Scientists are working hard to develop new ways to identify and treat genetic disorders and diseases with a genetic link

- **Genetic Testing** - test that determines changes in chromosomes, genes or proteins; help determine a person's chance for developing or passing on a genetic disorder
- **Gene Therapy** - Experimental technique where a defective copy of a gene is replaced with a healthy copy

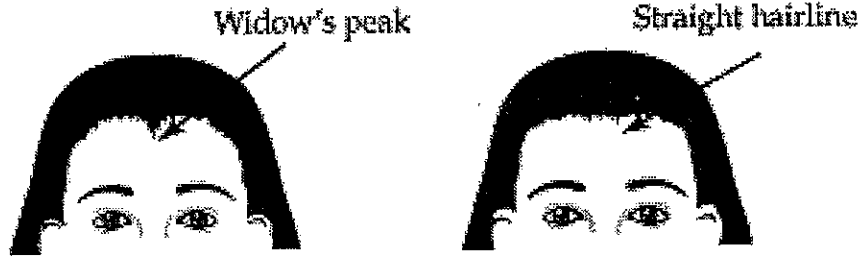
Period _____

4.4 Heredity Practice

Take a look at the traits/characteristics in the table below. Figure out what your phenotype is (observable characteristics) and what your possible genotype(s) is/are (genetic composition of alleles).

Trait	Your phenotype	Your possible genotype(s)
Tongue Rolling Dominant = Ability to roll (RR or Rr) Recessive = No ability to roll (rr)		
Free Ear Lobes Dominant = Free (FF or Ff) Recessive = Attached (ff)		
Widow's Peak Dominant = Present (WW or Ww) Recessive = Absent (ww)		
Straight Thumb Dominant = Straight thumb (JJ or Jj) Recessive = "Hitchhiker's Thumb" (jj)		
Bent Little Finger Dominant = Bent (SS or Ss) Recessive = Straight (ss)		
Interlaced Fingers Dominant = Left-over-right thumb (LL or Ll) Recessive = Right-over-left thumb (ll)		
Chin Cleft Dominant = No cleft (CC or Cc) Recessive = Cleft (cc)		
Mid Digital (Finger) Hair Dominant = Present (FF or Ff) Recessive = Absent (ff)		
Eye Shape Dominant = Almond (EE or Ee) Recessive = Round (ee)		
Eyelashes Dominant = Long (EE or Ee) Recessive = Short (ee)		
Dimpled Cheeks Dominant = Present (CC or Cc) Recessive = Absent (cc)		
Tongue Folding Dominant = Inability (TT or Tt) Recessive = Ability (tt)		

4.4 Heredity Practice with Punnett Squares



<p>Key:</p> <p>Widow's Peak = Dominant = T Straight Hairline = Recessive = t</p> <p>Fill in the possible genotypes (combinations of alleles) in the next two columns →</p>	<p>Widow's Peak</p> <table border="1" style="margin: auto;"> <tr> <td style="width: 30px; height: 30px;"></td> <td style="width: 30px; height: 30px;"></td> </tr> </table> <p style="text-align: center;">Or</p> <table border="1" style="margin: auto;"> <tr> <td style="width: 30px; height: 30px;"></td> <td style="width: 30px; height: 30px;"></td> </tr> </table>					<p>Smooth Hairline</p> <table border="1" style="margin: auto;"> <tr> <td style="width: 30px; height: 30px;"></td> <td style="width: 30px; height: 30px;"></td> </tr> </table>		

Family Tree

With the information provided, determine which genotype each person in the family must have. The mother has a widow's peak and the father has a smooth hairline. They have two children. One child has a widow's peak and the other has a smooth hairline.

<p>Mother Widow's Peak</p> <table border="1" style="margin: auto;"> <tr> <td style="width: 30px; height: 30px;"></td> <td style="width: 30px; height: 30px;"></td> </tr> </table>			<p>Father Smooth Hairline</p> <table border="1" style="margin: auto;"> <tr> <td style="width: 30px; height: 30px;"></td> <td style="width: 30px; height: 30px;"></td> </tr> </table>			<p>Child 1 Widow's Peak</p> <table border="1" style="margin: auto;"> <tr> <td style="width: 30px; height: 30px;"></td> <td style="width: 30px; height: 30px;"></td> </tr> </table>			<p>Child 2 Smooth Hairline</p> <table border="1" style="margin: auto;"> <tr> <td style="width: 30px; height: 30px;"></td> <td style="width: 30px; height: 30px;"></td> </tr> </table>		

Make two punnett squares to help determine which genotype the mother and child 1 must have.

How do you know which combination of genes is correct for two people with a widow's peak in the family tree?

Period _____

Teen Pregnancy

Watch the following two YouTube Video Clips. Then answer the questions below.

Teen Pregnancy in America (10:13)

<https://goo.gl/2cxLna>

Teen Pregnancy: After the Baby is Born (6:48)

<https://goo.gl/uiXxJ2>

1. How does Hannah respond to being pregnant?
 - a. How do you think you would respond if you became pregnant as a teenager or got someone pregnant?

2. What do you think Jeremy and Alike are doing differently than most teens in relationships that helps them stay together?
 - a. Did the status of their relationship surprise you after watching the second video clip? Explain your answer.

3. Mahogany's friends seem pretty supportive of her pregnancy. How do you think your own friends would respond? What about your peers that you are not close with?

