Living Things Inherit Traits in Patterns.

Chapter 4 Sections 1and 2

Parents and offspring are similar.

- We all have our own unique combination of characteristics. These are called _____. There are two types of traits:
  - _____ traits resemble those your birth parents have, like hair color, eye color, blood type.
  - _____ traits are developed during your life, like learned behaviors and skills (ability to read and write, the ability to ride a bike), and results of interactions with the environment
    - Skin color is both inherited and environmental (acquired).

Genes are on chromosome pairs.

- _____- a cell containing genetic material from the mother and a cell containing genetic material from the father combine into a completely new cell, which becomes the offspring.
- _____ is the passing of genes from parents to offspring.
- A _____ is a unit of heredity that occupies a specific location on a chromosome and codes for a particular product.
- Genes are inherited from parents, NOT traits. Most traits are affected by many genes, not just one.

Chromosomes and Alleles

- Remember chromosomes are in pairs. (Humans have _____ pairs.)
- Two chromosomes in a pair are called _____. They resemble each other, have the same size and shape, and carry genetic material for particular traits. (They are called a _____ pair)
- There are sites on each homolog where particular genes are located. Both homologs may have the same gene, but the genes may not be identical. They may be variations. These variations of the same gene are called _____.

Sex Chromosomes

- Scientists refer to chromosomes by their number, 1 through 22. The _____ pair are the sex chromosomes.
- In humans, the sex chromosomes are called the X chromosome and the Y chromosome.
- A human female has two _____ chromosomes. (_____)
- A human male has one _____ chromosome and one _____ chromosome. (_____)
- These chromosomes determine the sex of the offspring, as well as contain important genes like the other numbered 1-22 chromosomes.

Gregor Mendel's discoveries

- Gregor Mendel was an Austrian monk in the 1800's.
- He worked with traits in pea plants, studying each trait separately.
- Mendel took a true-bred regular height plant and a true-bred short/ dwarf plant. He crossed plants with specific traits and found that offspring get factors for each trait from both parents.
  - He realized each plant must have two "factors" for each possible trait: one from each parent. Some traits could be masked. These "factors" are what we not call genes and alleles.

Alleles interact to produce traits.

- _____ – describes the actual characteristics that can be observed. (What you can see in the mirror.)
  - Height, eye color, size of your feet
- _____ – the genes an organism has. Your genotype isn't always obvious by looking at your phenotype. You could have one or two alleles for that phenotype. Sometimes your genes contain information that is not expressed in your phenotype.
  - Ex: Your phenotype is brown eyes, but your genotype may have one allele that is brown eyes, and one allele that is blue eyes but is not expressed.

Dominant and Recessive Alleles

- A _____ allele is an allele that is expressed in the phenotype even if only one copy is present in the genotype.
  - Ex: Brown eyes are dominant because even if there was only one copy, the offspring's eye color would still be brown.
- A _____ allele is an allele that is expressed in the phenotype only if the two copies of it are present in the genotype.
  - Ex: Brown eyes are dominant, so there would have to be blue eyes present on both copies for the offspring to have blue eyes.
- If there is only one recessive allele, the _____ phenotype will appear.

Patterns of heredity can be predicted.

- Mendel noticed traits are inherited in _____. A tool for understanding the patterns of heredity is called a _____.
- Each parent has _____ alleles for a specific gene. A Punnett Square shoes how the parents' alleles may be passed on to potential offspring.
- Dominant alleles are expressed in a capital letter. Ex: "D"
- Recessive alleles are expressed in a lower-case letter. Ex: "d"
- Example problem: DD x dd

Punnett Squares

	D	D
d		
d		

- Parent 1 Tree has a genotype of DD
- Parent 2 Tree has a genotype of dd

Ratios and percentages can express the probability of outcomes.

- Our Punnett Square example shows an outcome of 100% regular height, because we had four combinations: Dd, Dd, Dd, Dd. These combinations all had one dominant allele, and the dominant allele (D) wins over the recessive allele (d). So all four offspring will be regular height.
- _____ – two different alleles are expressed in the offspring
  - Ex: Dd
- _____ – both alleles are the same
  - Homozygous dominant: both alleles are dominant (DD)
  - Homozygous recessive: both alleles are recessive (dd)

Ratio

- Let's look at our example. There is a 100% chance that the offspring plant will be regular height, right?
- A _____ compares or shows the relationship between two quantities.
- The ratio in this case is written as 4:4 ("four to four", and can be interpreted as "four out of 4")

	D	D
d	Dd	Dd
d	Dd	Dd

Dominant squares are highlighted in red. There is a 4:4 ratio of red squares to total squares.

Probability

- Punnett Squares and the ratios they show express probability.
- _____ is the likelihood (or chance) of a specific outcome in relation to the total number of possible outcomes.
- The ratios we get from a Punnett Square tell us the probability that any one offspring will get certain genes and express certain traits.
- The other way to express a probability is as a percentage.
  - A percentage is a ratio that compares a number to 100.
  - It states the number of times out of a hundred a particular outcome might happen.

Guinea pigs and fur color…

	B	b
B		
b		

B = black fur
B = brown fur

What is the probability that the offspring will be brown? Black?

Probability

- When one parent has two dominant alleles and one parent has two recessive alleles, there is a 100% chance that an offspring will have the dominant phenotype.
- When both parents have one dominant and one recessive allele, there is a 75% chance that an offspring will have the dominant phenotype.
- It's important to note that probability and Punnett Squares do not guarantee the outcome, but are just an estimate of probability.

Gender probability

	X	X
X		
Y		

B = black fur
B = brown fur

What is the probability that the offspring will be male? Female?