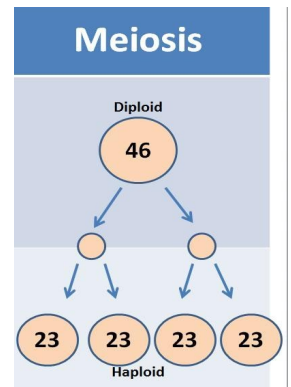
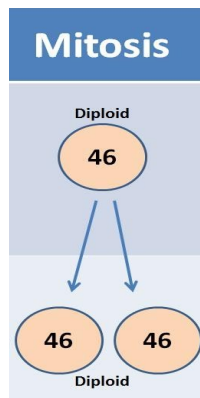


Guided Notes: Meiosis/Genetic Diversity, Sexual Reproduction/Genetics and Biotechnology

Mitosis	Meiosis
<ul style="list-style-type: none"> ● Mitosis is a form of _____ _____ ○ This means it only requires _____ organism, (ex. _____) ○ For growth and repair of _____ (body) cells ○ Results in _____ cells _____ to the original (parent) cell ● Recall that DNA is condensed into _____ ○ Humans have a total of _____ different chromosomes per cell (_____ pairs) <ul style="list-style-type: none"> ■ _____ of the pairs are autosomes (present in all) ■ BUT, _____ pair that are the _____ chromosome either _____ or _____ ● When mitosis occurs, each new cell will have _____ chromosomes, just like the original ● The cells produced in mitosis are _____, they contain _____ complete sets (_____) of chromosomes 	<ul style="list-style-type: none"> ● Meiosis is a form of _____ _____ ○ This means it takes _____ organisms to make a new organism ○ Results in _____ daughter cells that are _____ identical to the parent cells ○ These daughter cells are called _____ (sperm and egg cells) that combine to make a new organism ○ Male Gamete: _____, produced in the male _____, testes ○ Female Gamete: _____, produced in the female _____, ovaries ● There are _____ phases in Meiosis <ul style="list-style-type: none"> ○ Meiosis I - the cell _____ ○ Meiosis II - the cell _____ again, creating _____ cells ● The cells produced in Meiosis <ul style="list-style-type: none"> ○ _____ - meaning they only contain half of the chromosomes of a diploid cell (n) ○ Each new cell will have _____ chromosomes, _____ of the original ● Why only half? <ul style="list-style-type: none"> ○ The _____ gametes (n) fuse during fertilization to make a _____ cell (2n) ○ This new cell is called a _____ and it will grow into a new organism

Guided Notes: Meiosis/Genetic Diversity, Sexual Reproduction/Genetics and Biotechnology

Mitosis Overview	Meiosis Overview
<ul style="list-style-type: none"> • Asexual _____ • _____ of somatic cells • _____ (2n) cell • _____ Chromosomes • Divides _____ • Produces _____ identical cells with _____ chromosomes 	<ul style="list-style-type: none"> • _____ Reproduction • A _____ (2n) cell divides • Produces _____ different haploid _____ (n) each with _____ of the original chromosomes _____ • Gametes are the _____ and _____ cells • Two gametes combine to form a diploid _____ (2n) with its _____ chromosomes (46)



	Mitosis	Meiosis
Type of Reproduction		
Purpose		
Number of Divisions		
Number of Cells Produced		
Number of Chromosomes		

Guided Notes: Meiosis/Genetic Diversity, Sexual Reproduction/Genetics and Biotechnology

Vocabulary Review: Define the following terms

1. Mitosis -
2. Meiosis -
3. Haploid -
4. Diploid -
5. Gametes -
6. Zygote -
7. Asexual Reproduction -
8. Sexual Reproduction -
9. Autosomal Cells -
10. Somatic Cells -

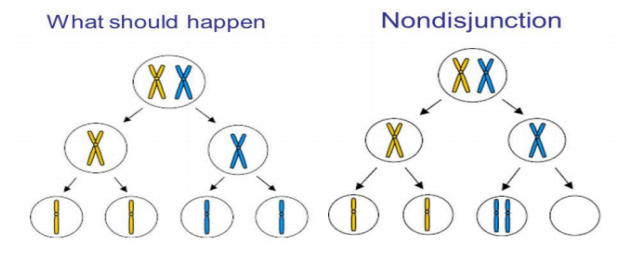
Guided Notes: Meiosis/Genetic Diversity, Sexual Reproduction/Genetics and Biotechnology

Why is Meiosis important?


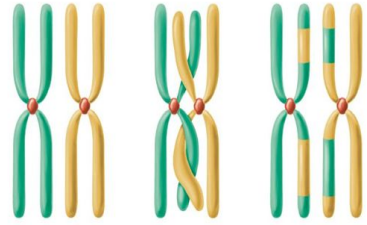
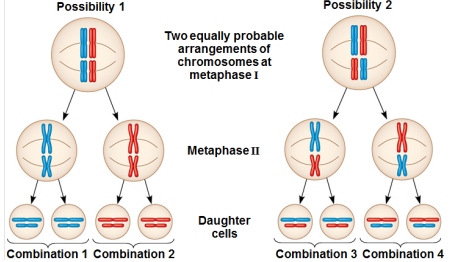

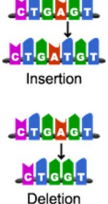
- Leads to greater _____
- Genetic Diversity - traits that are _____ of one another, allowing organisms to be genetically different
- Groups with varying _____ have a greater chance to _____ and flourish, (ex. _____)
- Genetic diversity reduces the incidence of _____ traits, (ex. _____)

Sources of Genetic Diversity

- _____ - nonspecific unions of chromosomes during meiosis make genetic variation possible
 - Sexual Reproduction produces the _____ amount of variation, which is essential for the survival of a population
- _____ - produces distinct gametes, where (n) represents the unique number of chromosomes
- _____ - homologous chromosomes (a set, 1 maternal and 1 paternal)
 - exchange genetic material between chromosomes
 - Result in greater _____
- _____ - can cause variations in genes by introducing new traits into a population
 - _____ that can be passed down are the ones found in the gametes
 - Mutations such as tobacco smoke cannot be passed down
 - _____ - failure of homologous chromosomes to separate correctly



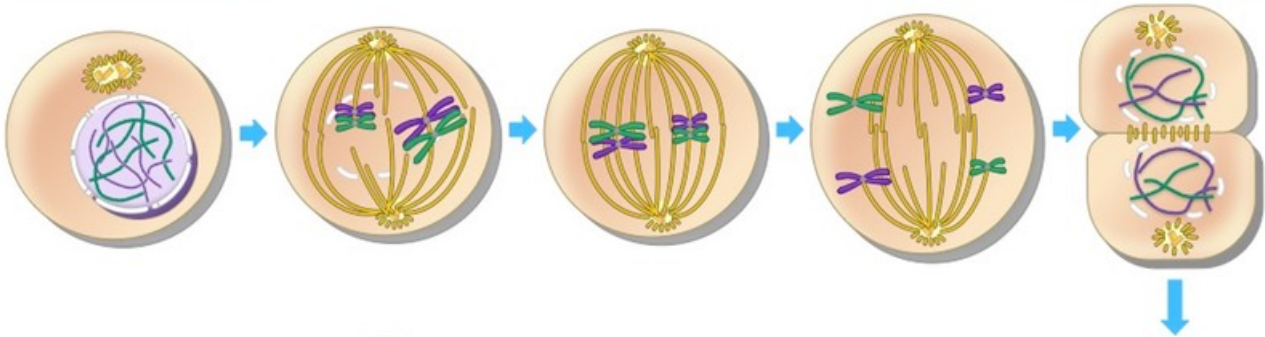
Guided Notes: Meiosis/Genetic Diversity, Sexual Reproduction/Genetics and Biotechnology

Source	Concept	Produced
<p>_____</p>	<p>any set of genes has an equal opportunity of combining to be passed to the offspring</p>	<p>completely unique traits</p> 
<p>_____</p>	<p>chromosomes exchange traits</p>	 <p>homologous chromosome pair</p> <p>As the chromosomes move closer together, synapsis occurs.</p> <p>Chromatids break, and genetic information is exchanged.</p>
<p>_____</p>	<p>each allele is separate from one another</p>	 <p>Possibility 1</p> <p>Possibility 2</p> <p>Two equally probable arrangements of chromosomes at metaphase I</p> <p>Metaphase II</p> <p>Daughter cells</p> <p>Combination 1 Combination 2</p> <p>Combination 3 Combination 4</p>
<p>_____</p>	<p>introduction of altered genes in a population, not all gene mutations can be passed down</p>	<p>Point Mutation</p>  <p>Point mutation</p> <p>Frameshift Mutation</p>  <p>Insertion</p> <p>Deletion</p>

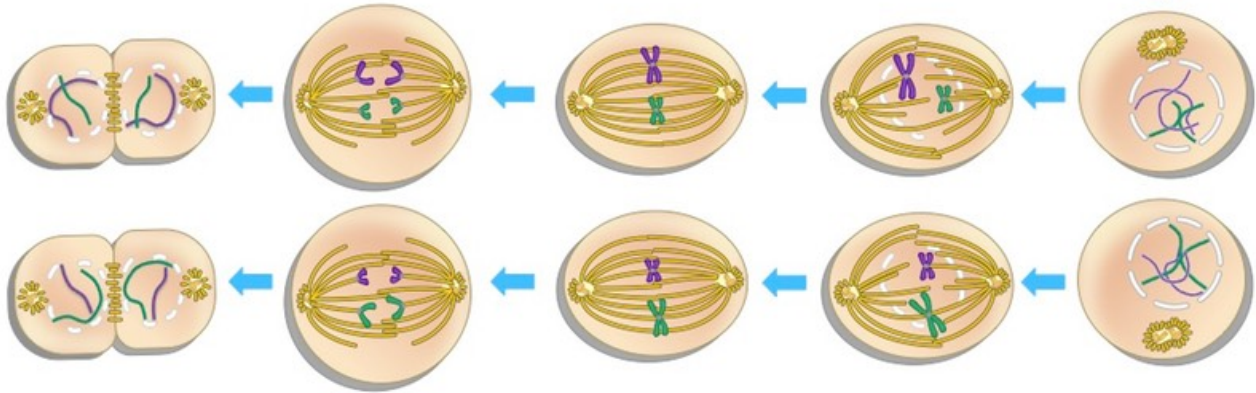
Guided Notes: Meiosis/Genetic Diversity, Sexual Reproduction/Genetics and Biotechnology

Label each of the following:

Meiosis I



Meiosis II



Karyotype

- Map of an _____ chromosomes
- Usually completed to check for _____
- Each cell contains the same genetic information therefore they only examine one cell

- Each homologous pair is matched according to their
 - size
 - _____
 - location of centromere
 - band patterns
- Autosomal or somatic chromosomes are _____ first, the first 22 pairs
- The _____ pair, sex chromosomes are placed at the end

Guided Notes: Meiosis/Genetic Diversity, Sexual Reproduction/Genetics and Biotechnology

Chromosomal Abnormalities

- ★ Trisomy 21 or Down's Syndrome - _____
- ★ Cri-du-Chat Syndrome - _____
- ★ 47, XXY or Klinefelter Syndrome - _____
- ★ Turner Syndrome - _____

Which parent determines the sex of their offspring? _____

What sex cells represent a female? _____

What sex cells represent a male? _____

Guided Notes: Meiosis/Genetic Diversity, Sexual Reproduction/Genetics and Biotechnology

Vocabulary Review: Define the following terms

1. Homologous Chromosome -
2. Random Fertilization -
3. Independent Assortment -
4. Crossing Over -
5. Gene Mutation -
6. Nondisjunction -
7. Genetic Diversity -
8. Karyotype -
9. Trisomy Syndrome -
10. Cri-de-chat Syndrome -
11. Klinefelter Syndrome -
12. Turner Syndrome -

Guided Notes: Meiosis/Genetic Diversity, Sexual Reproduction/Genetics and Biotechnology

Biotechnology: Genetic Engineering

- _____ refers to any process in which man _____ an organisms

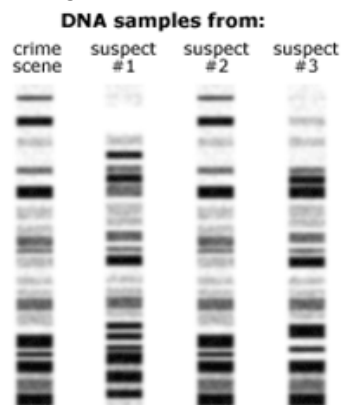
- Examples: _____

Gel Electrophoresis

- _____ is the process of separating _____ based on _____
- This process of comparing _____ is used in a number of things, including
 - _____ individuals through _____
 - _____ ID
 - _____ relationships
- **Steps in Gel Electrophoresis**
 - _____ samples are cut into different sized fragments using restriction _____
 - Fragments are run on _____ through an electric current. _____ fragments move _____ (not as far), while _____ pieces will move _____ (farther)
 - These movements will create _____ on the gel that can be read under UV light or through _____
 - The different bands are then able to be compared to other _____ segments for _____

➤ Reading Gels: Identifying Individuals

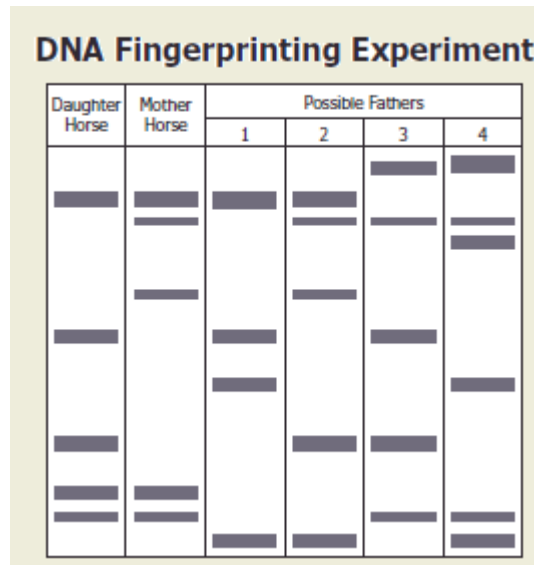
- DNA _____ are different for every person
- Can be used to identify _____
- Which suspects gel on the right matches the scene of the crime?



Guided Notes: Meiosis/Genetic Diversity, Sexual Reproduction/Genetics and Biotechnology

➤ **Reading Gels: Paternity**

- Parental gels can help determine the father
- Gels are read with _____ the bands coming from mom and half from _____
- In the gel below, who is the father shown 1, 2, 3 or 4?



➤ **Reading Gels: Endangered Species**

- Species can be identified using gel electrophoresis - used in _____ and _____ species

Transgenic Organisms

- A transgenic organism is any organism that has a _____ from another organism within it
 - Inserting a _____ piece of _____ into a cell
 - Transgenic organisms come about when humans would like the _____ of one organism to be present in another!
 - Transgenic organisms are commonly used in agriculture and industries like pharmaceutical companies
- Transgenic Organisms: Agriculture
 - Sometimes, transgenic organisms are grown in _____ in order to help keep crops _____, resist _____, produce higher yield and last longer
 - Examples: _____
- Transgenic Organisms: Industry
 - Transgenic organisms have allowed for the production of things previously unavailable to us

Guided Notes: Meiosis/Genetic Diversity, Sexual Reproduction/Genetics and Biotechnology

- Examples: _____
 - Insulin dependent diabetics must inject insulin because their body does not produce or use it normally
 - Thanks to genetic engineering, scientists have found a way to create _____ insulin produced by _____ or yeast
- Things like this are done through a process called _____.
 - **Steps of Bacterial Transformation:**
 - First, you must _____ the gene of interest
 - Insertion of foreign DNA gene into bacterial _____. Done using restriction enzymes and DNA ligase.
 - A plasmid is a genetic structure in a cell that can be separated from the _____ DNA and replicate independently; typically used in lab manipulation of _____
 - Getting bacteria to take a plasmid, Recombinant DNA is _____ into the bacteria.
 - Selecting the _____ transformed bacteria
 - Producing the _____
 - The bacteria has now been _____ to produce the product based on the genes that were selected and inserted (example: _____)
- **Selective Breeding:** _____
 - Example: _____

The Human Genome Project

- Started in _____, the Human Genome Project was started with the goal of determining the _____ of chemical base pairs that make up human _____
- The _____ was established with the hope that knowing the human genome would allow them not only to _____ genes that cause genetic conditions (diabetes, heart disease, cancer), but also _____
- The Human Genome Project was successfully completed in _____
- For the first time, scientists were able to read the _____ of a human being

Guided Notes: Meiosis/Genetic Diversity, Sexual Reproduction/Genetics and Biotechnology

Gene Therapy

- Gene therapy is a method of using _____ to treat or _____
 - Nucleic acids _____ inserted into cells as a drug are used to express proteins or interfere with expression
 - Remember: DNA codes for _____ that determines traits!
- Uses include:
 - _____: An immunodeficiency disease in one in which disorders prevent the body from fighting infections and diseases the way it should
 - _____

Ethical Issues in Biotechnology

- Genetically modified organisms, or _____, are often a big debate-especially since many are _____ by us!
 - Example: _____
- They are produced for numerous reasons in order to benefit _____, including increasing crop production, lowering _____
- There is debate; however, on whether this is always _____ for human consumption since the _____ do not occur _____
 - Allergies, gene transfer to cells of the body

The Debate over Biotechnology

- When talking about this topic, the largest issue is always the _____ of such methods
- What do you think?
 - Should science _____?
 - Should science improve other organisms?
 - What _____ might there be to this technology?

➤ **Transgenic Organisms**

- Example: _____
- Used to: _____

Guided Notes: Meiosis/Genetic Diversity, Sexual Reproduction/Genetics and Biotechnology

➤ Cloning

- Making an _____ copy of an organism
- Steps:
 - Take unfertilized egg from a female and remove the _____
 - Retrieving the nucleus of _____ (body) cell of individual you would like to clone
 - Inserting the somatic nucleus into _____ cell
 - Providing _____ factors needed
- First animal to be cloned was Dolly the sheep in 1996

➤ Gene Therapy

- Recall that gene therapy uses the alteration of a person's genes to treat genetic conditions
- Ethical issues surrounding this include:
 - Who decides which _____ are normal/faulty?
 - Will this only be available to _____ individuals?
 - Should it be used to _____ other traits, like height, intelligence or athletic ability?

➤ Stem Cells

- Stem cells are _____ cells that can become any different type of cells
 - Recall that differentiation takes place as a _____ develops - undifferentiated cells become complex system of tissues and cell types
 - _____ - can become all cell types in the human body
 - _____ - thought to be limited to differentiating into only those cell types of their tissue of origin (ex. brain, heart, blood, etc)
 - _____ are used in research with the potential to treat diseases and aid in research
 - However, _____ issues cause debate since stem cells are derived from zygotes - in order to use them, human embryos must be _____
 - Debate is still ongoing, but new research about stimulating a patient's cells to behave like stem cells may open new possibilities

➤ WHAT DO YOU THINK?