Guided Notes: Biotechnology

Genetic Engineering

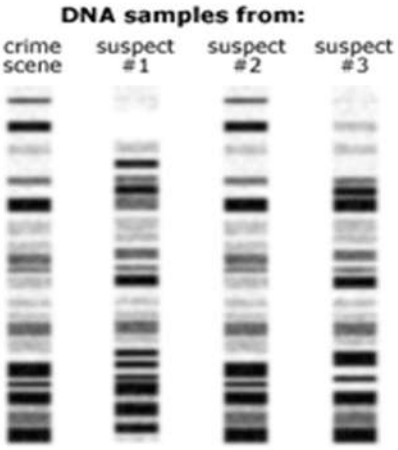
- _____ refers to any process in which man _____ an organisms _____
  - Examples include: _____

Gel Electrophoresis

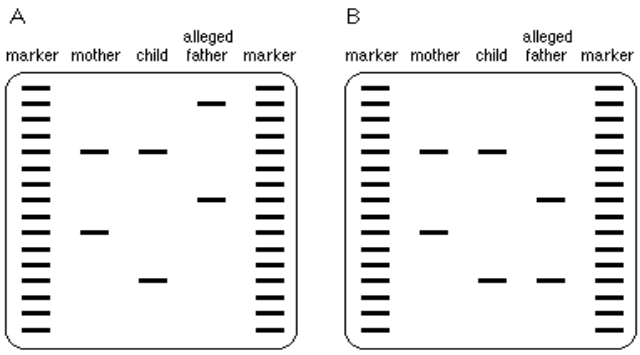
- _____ is the process of separating _____ based on _____
  - Process of comparing _____ is used in a number of things, including:
    - _____individuals through _____
    - _____ ID
    - _____ relationships

- 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?



- 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 to the right, is the father shown in A or B?



- 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 include:
        - BT Corn: _____
        - Frost Resistant Strawberries _____

- Transgenic Organisms: Industry
    - Transgenic organisms have allowed for the production of things previously unavailable to us
    - Example: _____
        - Insulin 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 in the 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 (ex. _____)

- 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, etc.), but also _____!
- The Human Genome Project was successfully completed in _____!
- For the first time, scientists were able to read the _____ of a human being!

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 determine 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, etc.

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: _____

- Cloning
  - Making an _____ copy of an organism.
  - Steps:
    1. Taking unfertilized egg of female and removing _____
    2. Retrieving nucleus of _____ (body) cell of individual you would like to clone
    3. Inserting the somatic nucleus into _____cell
    4. 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 (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 patients cells to behave like stem cells may open new possibilities

- What do you think??