

## CORNELL NOTES

Directions: You must create a minimum of 5 questions in this column per page (average). Use these to study your notes and prepare for tests and quizzes. Notes will be stamped after each assigned sections (if completed) and turned in to your teacher at the end of the Unit for scoring.

# UNIT 3: GENETICS

## Chapter 9: Frontiers of Biotechnology

### I. Manipulating DNA (9.1)

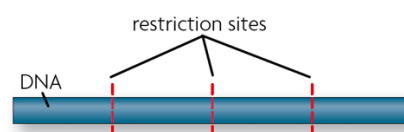
#### A. Scientists use several techniques to manipulate DNA

1. DNA is a very \_\_\_\_\_ molecule
2. Still too small to see or work with directly
  - a. Scientists work with DNA without being able to \_\_\_\_\_ it directly
  - b. Use \_\_\_\_\_, computers, and bacteria as \_\_\_\_\_ to study DNA
3. Led to many biotechnology applications- genetic engineering, DNA fingerprinting, cloning, etc.)

#### B. Restriction Enzymes \_\_\_\_\_ DNA

1. Scientists use \_\_\_\_\_ as "scissors" to cut slice chromosomes into pieces for study
2. Enzymes which slice apart DNA come from many different \_\_\_\_\_
  - a. Bacteria use enzymes to combat \_\_\_\_\_ DNA that invade their cells.
  - b. Called **Restriction Enzymes** (restrict or decrease the effect of \_\_\_\_\_ on bacterial cell)
3. Restriction enzymes **cut** DNA at specific \_\_\_\_\_
  - a. Look for special sequence of \_\_\_\_\_ and cuts the \_\_\_\_\_ at that point
  - b. Different number of \_\_\_\_\_ and different \_\_\_\_\_ result

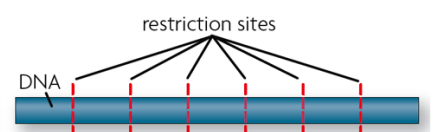
Restriction Enzyme 1



The DNA is cut into four fragments.



Restriction Enzyme 2



The DNA is cut into seven fragments.

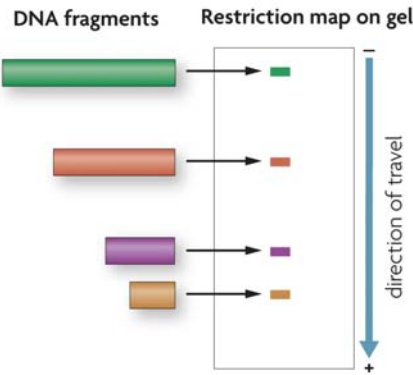


C. Restriction maps show the \_\_\_\_\_ of **DNA fragments**

1. **Gel electrophoresis**- technique using \_\_\_\_\_ current to separate mixture of DNA fragments from each other



2. **Restriction Maps**- pattern of \_\_\_\_\_ on gel show lengths of fragments



a. Comparison of restriction maps can help diagnose \_\_\_\_\_.

b. A \_\_\_\_\_ could change a restriction site and result in different **fragments**.

## II. Copying DNA (9.3)

A. **PCR** uses \_\_\_\_\_ to copy DNA segments

1. **Polymerase chain reaction (PCR)**- technique used to make \_\_\_\_\_ of specific DNA sequence.

2. Adapted the process of DNA \_\_\_\_\_ in cell to be used in test tube.

B. PCR uses just four materials

1. The \_\_\_\_\_ to be copied,

2. **DNA** \_\_\_\_\_ (enzymes)

3. **DNA** \_\_\_\_\_

4. two \_\_\_\_\_ (a short sequence of DNA acting as starting point for new strand)

## III. DNA Fingerprinting (9.3)

A. A **DNA fingerprint** is a type of \_\_\_\_\_ map

1. Every individual (except identical twins) has a **unique** set of \_\_\_\_\_

2. A DNA fingerprint is a representation of parts of individuals DNA that can be used to identify a person a \_\_\_\_\_ level

a. Use sequences of DNA that \_\_\_\_\_ **greatly** from one individual to another

b. Restriction enzymes cut into \_\_\_\_\_

c. **Gel electrophoresis** used to look for different \_\_\_\_\_ and \_\_\_\_\_ of fragments

B. DNA fingerprinting is used for \_\_\_\_\_

1. Chance of having same DNA fingerprint is **one chance in \_\_\_\_\_ million people**

2. DNA fingerprinting used in legal cases (crimes, paternity cases, studying genetic diversity)

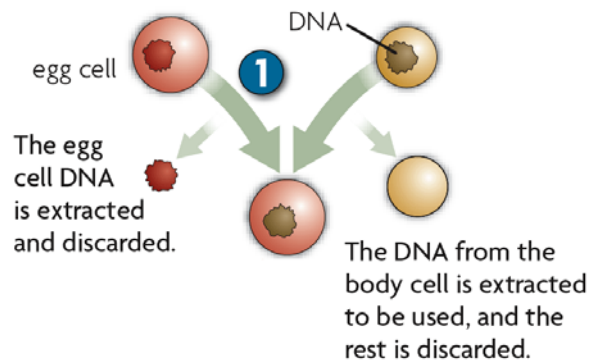
#### IV. Genetic Engineering (9.4)

A. Entire \_\_\_\_\_ can be cloned

1. **clone**- genetically identical copy of \_\_\_\_\_ or of an \_\_\_\_\_

2. Some simple animals can essentially clone themselves by \_\_\_\_\_ (sea star)

3. In \_\_\_\_\_ - scientists swap DNA between cells



a. Unfertilized \_\_\_\_\_ taken from animal

b. Eggs \_\_\_\_\_ removed

c. nucleus of animal to be cloned in implanted into \_\_\_\_\_

d. After embryo grows for a couple days is transplanted into \_\_\_\_\_

4. \_\_\_\_\_ became first cloned mammal (sheep)

a. Led to cloning of pigs, dogs and mice

b. Clone may not look like original (many factors influence expression of gene- i.e. \_\_\_\_\_)

B. New genes can be added to organisms DNA

1. **Genetic engineering**- changing of an organisms DNA to give new \_\_\_\_\_

a. Based on use of Recombinant DNA technology

1). **Recombinant DNA**- is DNA that contains \_\_\_\_\_ from more than one organism.

2). Being used by scientist to make medicines, vitamins, vaccines, etc.

2. Genetic engineering produces organisms with new \_\_\_\_\_

a. **Transgenic organisms**- has one or more genes from another organism inserted into its \_\_\_\_\_.

1). **Transgenic plants**- provides resistance to frost, disease, and insects, and increase crops yields.

2). **Transgenic animals**- much \_\_\_\_\_ to produce

a). Will pass on transgenic trait to \_\_\_\_\_

b). Transgenic animals used in \_\_\_\_\_

3. Concerns about genetic engineering

a. \_\_\_\_\_ concerns-

b. **Environmental** concerns- long term effects

c. Decrease in **genetic** \_\_\_\_\_ - leave crops vulnerable to new disease or pests

V. Genomics and Bioinformatics (9.5)

A. **Genomics** involves the study of genes, gene functions, and entire genomes.

1. **Genomics**- study of \_\_\_\_\_

a. All studies of genomics begin with **gene sequencing**- determining the \_\_\_\_\_ of DNA nucleotides in genes or genomes

## b. Human Genome Project-

- 1). Completed mapping and sequencing of human DNA in \_\_\_\_\_
- 2). Still working on identifying \_\_\_\_\_ in the sequence

B. **Bioinformatics**- use of \_\_\_\_\_ databases to organize and analyze biological data

C. **Proteomics**- study and comparison of all the \_\_\_\_\_ that result from an organism's genome (used to study shared ancestry, disease, potential treatments)

## VI. Genetic Screening and Gene Therapy (9.6)

A. Genetic screening can detect genetic \_\_\_\_\_

1. **Genetic screening**- process of testing DNA to determine risk of having or passing on a genetic disorder.

2. Used to help save lives and make tough choices

B. **Gene therapy** is the replacement of faulty \_\_\_\_\_

1. Can replace \_\_\_\_\_ gene or add new gene into person's genome

2. Has great \_\_\_\_\_ and requires much more \_\_\_\_\_.

