Unit 4 KEY TERMS

Agarose gel — a semi-solid matrix formed by a polymer that creates an environment similar to a very densely woven spider web that enables molecules to be sorted by size (i.e., DNA fragments), shape, or electrical charge.

Blunt cut — a cut resulting from restriction enzymes that cut both strands of the target DNA at the same place.

Buffer — solution that stabilizes pH and provides ions to conduct electricity across a gel.

Cleave — to cut or separate.

CODIS — Combined DNA Index System — a federally maintained database used by law enforcement officials.

Comb — the plastic structure inserted in the acrylic gel tray to make the wells (the indentations) in the agarose gel.

DNA— deoxyribonucleic acid — the chemical molecule that is the basic genetic material found in most cells DNA is the carrier of genetic information from one generation to the next.

DNA polymerase — an enzyme that synthesizes a new DNA strand from a template strand and "proofreads" the new copy to ensure that it is a near perfect copy of the original or template DNA strand.

DNA fingerprinting — the technique of comparing RFLP's of different DNA samples obtained by sorting DNA fragments according to size using gel electrophoresis. Bands are compared with the control to determine which person's DNA matches the control DNA.

DNA fragments — DNA segments resulting when DNA is cut with a restriction enzyme. Fragments of different sizes (lengths) are produced.

DNA restriction analysis — used to help further our knowledge about the structure of DNA, for mapping and sequencing DNA, and also for DNA typing for identification purposes. Restriction analysis has three parts: DNA digesting, electrophoresis, and staining plus analysis. DNA fingerprinting utilizes DNA restriction analysis.

Digital micropipet — a basic tool of the biotechnologist that accurately measures liquid volumes in microliters (µl).

Electric field — electricity is used to move the DNA/protein through the gel matrix. When placed into an electric field, the charged molecules will migrate towards the opposite pole with the smaller fragments moving the fastest and traveling the farthest.

Gel electrophoresis — the process that uses gels made of agarose or some other polymer to separate DNA fragments or proteins by size, charge, or shape using electricity to move the electrically charged molecules through the gel. As the DNA moves through the tangled pores of the agarose fibers, the smaller pieces move faster and the larger pieces more slowly.

Gel lanes — the paths the molecules travel through the gel from the wells to the opposite end of the gel.

Gene — a sequence of DNA that codes for a protein and determines a trait.

Human genome — the human genome is the complete DNA sequence, including all 46 chromosomes found in humans.

Hybridization — the binding of complementary nucleic acids.

Microliter — (µl) a unit of measure used to measure liquid volume in molecular biology; 1000 µl = 1 ml.

Nucleotides — the four basic units that make up the DNA molecule. These are adenine (A), cytosine (C), guanine (G) and thymine (T).

Palindrome — a sequence of letters, words, or phrases that reads the same regardless of direction, for instance "Bob" or "madam." In reference to DNA, the sequence of nucleotides on one DNA strand is not a true palindrome. A DNA palindrome is found on a double strand of DNA whose 5'to 3'base pair sequence is identical on each strand. An example might look like this:

GAATTC
CTTAAG

Polymerase chain reaction (PCR) — a method used to make multiple copies of DNA in a laboratory setting.

Recombinant DNA technology — the techniques used to cut and create new combinations of DNA often from different organisms.

Restriction digest — the process of using any of the restriction enzymes that cut nucleic acids at specific restriction sites to produce fragments which are then known as restriction fragments.

Restriction enzymes — (restriction endonucleases) enzymes that act as "molecular scissors" to cut the DNA at a specific sequence (palindromic sequence) of nucleotides.

Restriction site — the specific sequence of nucleotides (palindromic sequence) that the restriction enzyme recognizes and "cuts" resulting in DNA fragments of different sizes.

RFLP(restriction fragment length polymorphism) — variation in the sizes of fragments produced when the DNA from different individuals is cut by one or more restriction enzymes. These polymorphisms are used as reference markers for mapping in relation to known genes or other RFLP loci.

Staggered cut — the cleavage of two opposite strands of duplex DNA at points near one another by a restriction enzyme; useful for the creation of recombinant DNA molecules.

Southern blotting — a process in which DNA fragments on a gel are transferred to a positively charged membrane (a blot) to be labeled RNA or cDNA fragments.

Sticky ends — the single-stranded ends that resultwhen restriction enzymes cut the DNA in an offset fashion, resulting in an end that has an overhanging piece of single stranded DNA. These single-stranded ends can anneal to other sticky ends that have complementary nucleotide sequences; helpful in producing recombinant DNA molecules.

STR — short-tandem repeats; micro satellites that contain 2-5 bases pair repeats.

VNTR — abbreviation for <u>variable number of tandem repeats</u>, sections of repeated DNA. Sequences found at specific locations on certain chromosomes; the number of repeats in a particular VNTR can vary from person to person; used in DNA fingerprinting.

Wells — the small, cup-like structures or indentations left in the agarose gel when the comb is removed. These wells will be filled with DNA or protein prior to electrophoresis.