DNA Technology – Ch20

- Genetic engineering: _____ manipulation of genes for _____ purposes

- Recombinant DNA: DNA in which genes from _____ are linked

- Biotechnology: manipulation of _____ or their components to perform practical tasks or provide useful products

DNA Cloning

- Restriction enzymes (endonucleases): in nature, these enzymes _____ bacteria from intruding DNA; they cut up the DNA (restriction); very _____
- Restriction site: _____ for a particular restriction enzyme
- Restriction fragments: _____ of DNA cut by restriction enzymes in a reproducible way
- Sticky end: _____ of restriction fragments
- DNA ligase: enzyme that can _____ the sticky ends of DNA fragments
- Cloning vector: DNA molecule that can carry _____ into a cell and replicate there (usually bacterial _____)

Steps of Eukaryotic Gene Cloning

- Isolation of cloning vector (bacterial plasmid) & gene-source DNA (_____)
- Insertion of gene-source DNA into the cloning vector using the same restriction enzyme; _____ the fragmented DNA with DNA ligase
- Introduction of cloning vector into _____ (transformation by bacterial cells)
- _____ of cells (and foreign genes)
- Identification of cell clones carrying the gene of interest

Storing Cloned Genes

- Genomic libraries: _____ of plasmid containing cell clones
    - Cloned genes can also be stored in phages
- cDNA: DNA made from mRNA that contains the _____ coding sequence of a gene (no introns)
- Nucleic acid hybridization: using a complementary DNA strand to attach to a gene of interest in a genomic library
    - _____ probe attaches and then a photographic film is used to view where the gene is located in the _____

Polymerase chain reaction (PCR)

- _____ of any piece of DNA _____ cells (in vitro)
- Materials: heat, DNA polymerase, nucleotides, single-stranded DNA primers
- Applications: fossils, forensics, prenatal diagnosis, etc.

DNA Analysis

Gel electrophoresis: separates nucleic acids or proteins on the basis of _____ or _____ creating DNA bands of the same length

Southern Blotting

- Used when there are _____ pieces of DNA fragments to be seen with normal gel electrophoresis
- Combination of gel electrophoresis and nucleic acid hybridization
- Uses: identifying carriers of _____

DNA Sequencing and Gene Expression

- Determination of _____ sequences (Sanger method, sequencing machine)
- Genomics: the study of genomes based on DNA sequences
- Human Genome Project

- Dideoxy Chain Termination Method: using a single strand of DNA to determine the exact sequence of the DNA strand

- RT-PCR: taking _____ from developmental stages of organisms to determine which genes are active at different times
    - Pull out the mRNA, make DNA strand, _____ specific gene of interest, and use gel electrophoresis to see the strands

Restriction fragment analysis

- Restriction fragment length polymorphisms (RFLPs): _____ of restriction fragments that are used to distinguish between individuals
- DNA Fingerprinting
- _____(STRs): variation from person to person; faster the RFLP analysis

Animal Cloning

- Steps
    - Mammary cell donor DNA is added to an _____ striped of its DNA
    - Cells are fused and grown in culture
    - _____ is added to surrogate mother
    - Baby is genetically _____ to mammary cell donor

Practical DNA Technology Uses

- Diagnosis of disease
- Human gene therapy
- Pharmaceutical products (vaccines)
- Forensics
- Animal husbandry (transgenic organisms)
- Genetic engineering in plants
- Ethical concerns?