Chromosome

Chromatin

SARs

Heterochromotin

Euchromatin

DNA replication

Semi-conservative model

Helicase

Single-string binding protein(SSB)

Primase

RNA

**rRNA**

**mRNA**

**tRNA**

**Promoter**

Cap of 5’ end of the RNA

Gene expression

Allele

Diploid

**Codons**

**ORF**

**Polycistronic mRNA**

**RBS/SD-sequence**

Adenylylation of amino acid

**Ribosome cycle**

**Polysome/polyribosome**

Synonyms

**Code degeneracy**

**The wobble rule**

**Missense mutation**

**Nonsense/stop mutation**

**Frame-shift mutation**

Reverse mutation

Suppressor mutation

Housekeeping gene

Inducible gene

Operon

Structural gene

Control element

Regulatory gene

**Cis-acting element**

**Trans-acting factor**

PIC(pre-inition complex)

**Enhancer**

Enhancer binding protein

Coactivator

Insulator

**Silencer**

TAD(transactivation domain)

**Gene**

**Genome**

**Genomics**

Gene family

Point mutation

SNP(single nucleotide polymorphism/Gene polymorphism)

Gene size

Gene number

**Gene density**

**Structural genomics**

**Functional genomics**

**Comparative genomics**

Eletrophoresis

**Restriction digestion**

DNA/RNA hybridization

Probe

Radioactive

Non-radioactive

**Southern blot**

**Northern blot**

**Western blot**

**PCR(polymerase chain reaction)**

Template

Primer

ddNTP

Plasmid

Vector

Chromosome

A single piece of coiled DNA containing genes, regulatory elements, other nucleotide sequences and DNA-binding protein which package DNA and control its function

Chromatin

Major component of DNA and histone protein

SARs

AT-rich fragments that are several hundred base pairs in length and define the bases of DNA loops

Hetero-chromatin

A tightly-coiled form of chromatin that carries genes and is inert genetically

Eu-chromatin

A light packed form of chromatin that carries genes and is often under active transcription

DNA replication

The process where DNA within a cell makes a exact copy of itself

Semi-conservative model

The new double helix has a template strand and a new daughter strand

Helicase

Enzyme that unwinds the double helix and starts at the replication bubble

Single-string binding protein(SSB)

Protein that keeps strands from re-annealing

Primase

Synthesizes the RNA primer which tells DNA pol where to start copying the DNA

RNA

A polymer composed of alternating units of ribonucleotide through 3’ to 5’ phosphodiester bond

**rRNA**

The RNA structural component of

**mRNA**

The RNA that transfers genetic information stored in DNA to a form for proteins synthesis

**tRNA**

Assist in decoding the genetic information stored in mRNA during translation by recruiting the correct amino acid to growing peptide chain

**Promoter**

DNA sequence that indicates where transcription should start

Cap of 5’ end of the RNA

A methylated guanine is joined to RNA transcript by 5’ to 5’ linkage

Gene expression

After transcription, the nucleotide sequence of mRNA is translated to amino acid sequence of the polypeptide

Allele

The same gene in the same chromosomal location, but with minor nucleotide change that yields slightly protein

Diploid

Have two copying of each genes and each chromosome

**Codons**

An ordered series of 3-nt-long unit of the mRNA that specify the order of amino acids

**ORF**

A continuous, non-overlapping string of codons that makes up the protein synthesis region of mRNA

**Polycistronic mRNA**

mRNA contains more than one ORF and codes for more than one protein

**RBS/SD-sequence**

Ribosome binding site that recruits translation machinery and is complementary with 3’ end sequence of 16s rRNA

Adenylylation of amino acid

The aminoacyl-tRNA synthetase attaches AMP to the -COOH group of amino acid utilizing ATP to create an aminoacyl adenylate intermediate

**Ribosome cycle**

The small and large ribosome subunits accociate with each other and mRNA, translate it, and dissociate after each round of translation

**Polysome/polyribosome**

An mRNA bings multiple ribosomes

Synonyms

Codons specify the same amino acid

**Code degeneracy**

Minimize the deleterious effects of mutations and errors in the reading of codons

**The wobble rule**

A tRNA is not complementary with the third base of codon normously to recognize not only one codon

**Missense mutation**

An alternation that changes a codon specific for one amino acid to a codon specific for another amino acid

**Nonsense/stop mutation**

An alternation causing a change to a chain-termination codon

**Frame-shift mutation**

Insertion or deletion of one or a small number of base pairs that alter the reading frame

Reverse mutation

Change an altered nucleotide sequence back to its original ariginal arrangement

Suppressor mutation

Suppress the change due to mutation at site A by producing an additional genetic change at site B

Housekeeping gene

Express constitutively, essential for basic processes involving cell replication and growth

Inducible gene

Express only when they are activated or de-repressed by cellular factors

Operon

a unit of prokaryotic gene expression and regulation which typically includes structural genes, control elements and regulator genes

Structural gene

encodes for enzymes in a specific biosynthetic pathway whose expressions are coordinately controlled

Control element

such as operator sequence

Regulatory gene

whose products recognize the control elements

**Cis-acting element**

Specific DNA sequence that is in the string of structural genes and influences gene expression

**Trans-acting factor**

Proteins that recognize and bind to cis-acting element directly or indirectly to regulate efficiency of transcription

PIC(pre-inition complex)

a large, universal complex of proteins that is necessary for the transcription of protein-coding genes in eukaryotes

**Enhancer**

DNA sequence that can increase the frequency of gene transcription located on the same strand

Enhancer binding protein

DNA-binding site and sites that bind to transcription factors assemble at the promoter of the gene

Coactivator

protein that bring enhancer binding proteins and proximal promoter binding factors together

Insulator

stretches of DNA located between enhancer(s) and promoter or silencer(s) and promoter of adjacent genes or clusters of adjacent genes

**Silencer**

control region of DNA that may be located thousands of base pairs away from the gene they control. However, upon bound by TFs, they repress gene expression

TAD(transactivation domain)

able to activate/enhance transcription by recruiting RNAP, directly or indirectly

**Gene**

a segment of DNA on a chromosome that codes for a specific protein and thus determines a trait

**Genome**

the entirety of an organism’s hereditary information

**Genomics**

the molecular characterization of whole genomes

Gene family

related genes may be organized in several clusters at different locations

Point mutation

change of a single nucleotide. Includes the substitution, deletion, insertion of one nucleotide in a gene

SNP(single nucleotide polymorphism/Gene polymorphism)

a single-letter change in DNA, part of the natural genetic variation within a population that creates diversity

Genome size

the length of DNA associated with one haploid complement of chromosomes

Gene number

the number of genes included in a genome

**Gene density**

the average number of genes per Mb of genomic DNA

**structural genomics**

characterizes the physical nature of whole genomes. Includes genetic mapping, physical mapping and sequencing of entire genomes

**functional genomics**

make use of the vast wealth of data produced by genomic projects to describe gene and protein functions and interactions

**comparative genomics**

a field where genomic features of different organism (diverse/related) are compared. The genomic features may include DNA sequence, genes ,gene order, regulatory sequences, and other genomic structural landmarks

Eletrophoresis

gel electrophoresis separates DNA and RNA molecules according to size, shape and topological properties

**Restriction digestion**

restriction endonucleases cleave DNA molecules at particular sites

DNA/RNA hybridization

the process of base-pairing between complementary ssDNA or RNA from two different sources

Probe

a labeled, defined sequence used to search mixtures of nucleic acids for molecules containing a complementary sequence

Radioactive

display and/or magnify the signals by radioactivity

Non-radioactive

display and/or magnify the signals by antigen labeling/antibody binding/enzyme binding/substrate

**Southern blotting**

a method routinely used in molecular biology for detection of a specific DNA sequence in DNA samples

**Northern blotting**

a technique used in molecular biology research to study gene expression by detection of RNA (or isolated mRNA) in a sample

**Western blotting**

an analytical technique used to detect specific proteins in a given sample of tissue homogenate or extract

**PCR(polymerase chain reaction)**

amplify a sequence of DNA using a pair of primers each complementary to one end of the DNA target sequence

Template

any source of DNA whose sequence information is known so that primers can be design

Primer

an oligo pool derived from protein sequence, about 18 to 30 nt long and have similar G+C contents so that they anneal to their complementary sequences at similar temperature

ddNTP

are chain-terminating nucleotides: the synthesis of a DNA strand stops when a ddNTP is added to the 3’ end. The absence of 3’-hydroxyl lead to the inefficiency of the nucleophilic attack on the next incoming substrate molecule

Plasmid

a small DNA molecule that is physically separate from, and can replicate independently of, chromosomal DNA within a cell

Vector

plasmids used in genetic engineering are called vectors