**Chapter 12 PPT Notes**

**DNA**

12-1 The Components and Structure of DNA

DNA is made up of **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

A nucleotide is a monomer of nucleic acids made up of:

* + - \_
    - \_
    - \_

There are four kinds of bases in in DNA:

* \_
* -
* -
* -

**Chargaff's Rules**

Erwin Chargaff discovered that:

* + - * The percentages of guanine \_\_\_\_\_\_\_\_\_and cytosine \_\_\_\_\_\_\_\_\_\_\_bases are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ in any sample of DNA.
      * The percentages of adenine \_\_\_\_\_\_ and thymine \_\_\_\_\_ bases are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ in any sample of DNA.

**X-Ray Evidence**

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ used X-ray diffraction to get information about the structure of DNA.

She aimed an X-ray beam at concentrated DNA samples and recorded the scattering pattern of the X-rays on film.

**The Double Helix**

Using clues from Franklin’s pattern, James Watson and Francis Crick built a model that explained how DNA carried information and could be copied.

**Watson and Crick's model of DNA was a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, in which two strands were wound around each other.**

Watson and Crick discovered that hydrogen bonds can form only between certain base pairs—adenine and thymine, and guanine and cytosine.

This principle is called **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

12-2 Chromosomes and DNA replication

**DNA and Chromosomes**

In \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ cells, DNA is located in the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

Most prokaryotes have a single DNA molecule containing nearly all of the cell’s genetic information.

Many eukaryotes have 1000 times the amount of DNA as prokaryotes.

Eukaryotic DNA is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ inside chromosomes.

The number of chromosomes varies widely from one species to the next.

**Chromosome Structure**

Eukaryotic chromosomes contain DNA and protein, tightly packed together to form **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

Chromatin consists of DNA tightly coiled around proteins called **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

DNA and histone molecules form nucleosomes.

Nucleosomes pack together, forming a thick fiber.

**DNA Replication**

Each strand of the DNA double helix has all the information needed to reconstruct the other half by the mechanism of base pairing.

In most prokaryotes, DNA replication begins at a single point and continues in two directions.

In eukaryotic chromosomes, DNA replication occurs at hundreds of places. Replication proceeds in both directions until each chromosome is completely copied.

The sites where separation and replication occur are called **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Duplicating DNA**

Before a cell divides, it duplicates its DNA in a process called **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

Replication ensures that each resulting cell will have a complete set of DNA.

**During DNA replication, the DNA molecule separates into two strands, then produces \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_following the rules of base pairing. Each strand of the double helix of DNA serves as a template for the new strand.**

**How Replication Occurs**

DNA replication is carried out by enzymes that “unzip” a molecule of DNA.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ between base pairs are broken and the two strands of DNA unwind.

The principal enzyme involved in DNA replication is **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

DNA polymerase joins individual nucleotides to produce a DNA molecule and then “proofreads” each new DNA strand.

12–3 RNA and Protein Synthesis

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** are coded DNA instructions that \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Genetic messages can be decoded by copying part of the nucleotide sequence from DNA into RNA.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**The Structure of RNA**

**There are three main differences between RNA and DNA:**

* + - The sugar in RNA \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_instead of deoxyribose.
    - RNA is generally \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
    - RNA contains \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ in place of thymine.

**Types of RNA**

**There are three main types of RNA:**

* + - **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
    - **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
    - **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** (mRNA) carries copies of instructions for assembling amino acids into proteins.

Ribosomes are made up of proteins and **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

During protein construction\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ transfers each amino acid to the ribosome.

**Transcription**

DNA is copied in the form of RNA

This first process is called **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**The Genetic Code**

The genetic code is the “language” of mRNA instructions.

The code is written using four “letters” (the bases: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

A **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** consists of three consecutive nucleotides on mRNA that specify a particular amino acid.

**Translation**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** is the decoding of an mRNA message into a polypeptide chain (protein).

Translation takes place on ribosomes.

**During translation, the cell uses information from messenger RNA to produce proteins.**

The ribosome binds new tRNA molecules and amino acids as it moves along the mRNA.

12-4 Mutations

**Mutations are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Kinds of Mutations**

Mutations that produce changes in a single gene are known as **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

Mutations that produce changes in whole chromosomes are known as **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Gene Mutations**

Gene mutations involving a change in one or a few nucleotides are known as **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** because they occur at a single point in the DNA sequence.

Point mutations include \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** usually affect no more than a single amino acid.

The effects of **insertions** or **deletions** are more dramatic.

The addition or deletion of a nucleotide causes a shift in the grouping of codons.

Changes like these are called **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

In an **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** an extra base is inserted into a base sequence.

**Chromosomal Mutations**

Chromosomal mutations involve changes in the number or structure of chromosomes.

Chromosomal mutations include \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

**Significance of Mutations**

Many mutations have little or no effect on gene expression.

Some mutations are the cause of genetic disorders.

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** is the condition in which an organism has extra sets of chromosomes.