

NOTES: DNA

What is DNA?

- A cell uses a code in its hereditary material
- This code is a chemical called deoxyribonucleic acid, or DNA
- DNA contains information for an organism's growth and function
- DNA is stored in cells that have a nucleus
- When a cell divides, the DNA code is copied and passed to the new cells
- In this way, new cells receive the same coded information that was in the original cell

DNA structure

- 1952 Rosalind Franklin discovered that DNA is two chains of molecules in a spiral form-by using an X-ray technique; showed that the large spiral was probably made up of two spirals
- 1953 James Watson and Francis Crick made a model of a DNA molecule, double helix

A DNA model

- According to the Watson and Crick DNA model, each side of the ladder is made up of sugar-phosphate molecules
- The rungs of the ladder are made up of other molecules called nitrogen bases
- Four kinds of nitrogen bases are found in DNA; they are represented by letters: --adenine T—thymine C—cytosine G—guanine
- The amount of cytosine in cells always equals the amount of guanine, and the amount of adenine always equals the amount of thymine
- Adenine always pairs with thymine and guanine always pair with cytosine

Copying DNA

- When chromosomes are duplicated before mitosis or meiosis, the amount of DNA in the nucleus is doubled
- The two sides of DNA unwind and separate
- Each side then becomes a pattern on which a new side forms
- The new DNA has bases that are identical to those of the original DNA and are in the same order.

Genes

- Most of your characteristics, such as the color of your hair, your height, and even how things taste to you, depend on the kinds of proteins your cells make
- DNA in your cells store the instructions for making these proteins
- Proteins build cells and tissues or work as enzymes
- The gene determines the order of amino acids in a proteins
- Changing the order of the amino acid makes a different protein

Making proteins

- Genes are found n the nucleus, but proteins are made on ribosomes in cytoplasm

- The codes for making proteins are carried from the nucleus to the ribosomes by another type of nucleic acid called ribonucleic acid or RNA

Controlling Genes

- In many-celled organisms, like you, each cell uses only some of the thousands of genes that it has to make proteins
- Each cell uses only the genes that direct the making of proteins that it needs. For example, muscle proteins are made in muscle cells but not in nerve cells
- Cells must be able to control genes by turning some genes off and turning other genes on.
- Sometimes the DNA is twisted so tightly that no RNA can be made
- Other times, chemicals bind to the DNA so that it cannot be used
- If the incorrect proteins are produced, the organism cannot function properly

Mutations

- If DNA is not copied exactly, the proteins made from the instructions might not be made correctly
- These mistakes, called mutations, are any permanent change in the DNA sequence of a gene or chromosome of a cell
- Outside factors such as X-ray, sunlight, and some chemicals have been known to cause mutations

Results of a mutation

- Genes control the traits you inherit
- Without correctly coded proteins, an organism cannot grow, repair, or maintain itself
- A change in a gene or chromosome can change the traits of an organism
- Mutations add variety to a species when the organism reproduces
- Many mutations are harmful to organisms, often causing death
- Some mutations do not appear to have any effect on the organism, and some can even be beneficial