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Science Notes  
Chapter 3 – Reproduction

Lesson 2 – How are traits passed on?

I. Structure of DNA

- a. For most organisms, a cell nucleus contains its chromosomes.
- b. Chromosomes contain a set of instructions that control all the activities of a cell.
- c. Chromosomes tell cells how to work together to form an individual organism.
- d. Chromosomes are made up of proteins and DNA.
- e. DNA stands for deoxyribonucleic acid.
- f. If you were able to stretch out the 46 chromosomes in a single human cell and lay them end to end, the strand would be about two meters long.
- g. The best time to see chromosomes is during cell division.
- h. In the 1950's, it was discovered that DNA is passed from a parent cell to its offspring.
- i. In 1953 James Watson and Francis Crick, described the structure of DNA.

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- j. Rosalind Franklin helped the scientists by taking X-Ray photographs of the chromosomes.
- k. DNA resembles a twisted ladder.
- l. The rungs are made up of bases known by the letters A, T, C, and G.
- m. A gene is a series of base pairs, or rungs.
- n. One known gene has over 2 million rungs.
- o. The genes in a cell determine an organism's characteristics.

## II. Copying DNA

- a. The DNA of all living things is made up of pairs of the same four bases.
- b. The order determines exactly what instructions each gene gives to an organism's cells.
- c. Two bases fit together to form each rung, but they fit together only in certain ways.
  - i. T -> A
  - ii. G -> C
- d. This pairing allows DNA to make an exact copy of itself during mitosis.

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- e. When DNA undergoes mitosis:
  - i. It “unzips” itself. Leaving a base attached to each side of the ladder.
  - ii. Extra bases float around inside the nucleus.
  - iii. The extra bases join the bases still attached to the DNA strands.
  - iv. Because they can only pair with certain bases, this ensures the two new complete strands of DNA are identical.

### III. The Human Genome Project

- a. In 1990 a group of scientists set out to map all the genes that make up the human chromosomes.
- b. By 2003 this group had charted the more than three billion base pairs that make up more than 30,000 genes in human DNA.
- c. Using the information learned through the Human Genome Project, scientists have found thousands of genes that cause diseases.
- d. They use this information to develop new treatments for diseases and hopefully learn to prevent them.