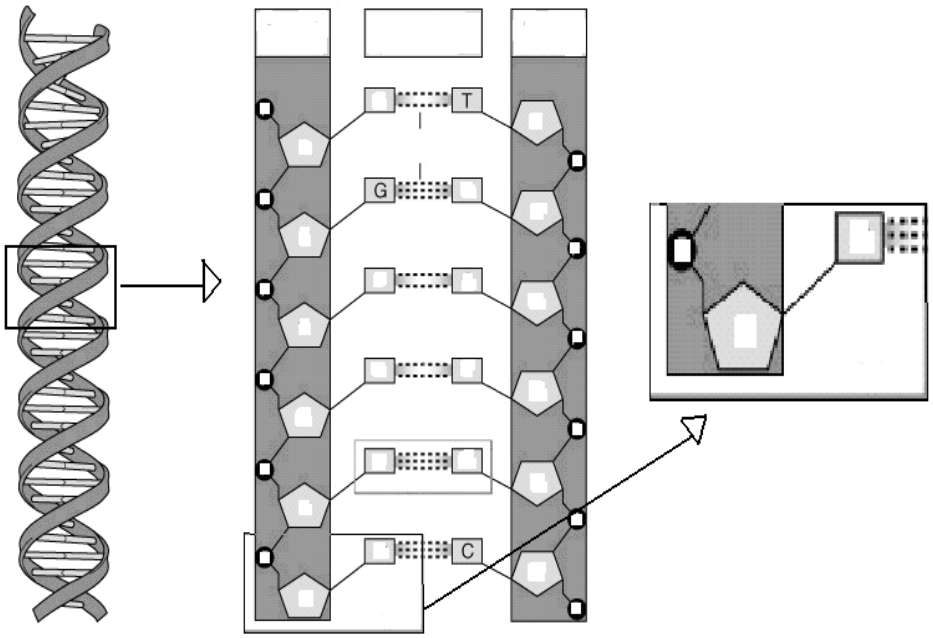
Class Notes ***Discovering the structure of DNA*** **Questions/Main Idea:**	Name: _____ Period:_____ Date: _____ **Notes:**
What is DNA?	• DNA = **deoxyribonucleic acid** • Holds all our cell's **information** • Located in the cell's **nucleus**
What we already know about DNA	• Codes for proteins essential to life • A nucleic acid macromolecule • Monomer of a nucleic acid is a nucleotide • The three parts of a nucleotide: – 1. Phosphate group – 2. Sugar (deoxyribose) – 3. Nitrogen base
Nitrogen bases	• The nitrogen base can either be a **purine** or a **pyrimidine**. • How many carbon rings does each have? – Purines have 2 – Pyrimidines have 1 • DNA has 4 nitrogen bases: – Thymine (T) – Adenine (A) – Cytosine (C) – Guanine (G) • Adenine and Guanine are purines Cytosine and Thymine are pyrimidines.
A collaborative effort!	• In the early 1900s, it was known that information had to be passed from cell to cell. However, it was not known what was responsible for carrying this information. • Some scientists thought that it must be protein, others that it was the nucleic acid. • Three major experiments helped show that it was a nucleic acid: – Griffith – Avery-MacLeod-McCarty – Hershey-Chase
Frederick Griffith got lucky?	• Griffith studied pneumonia bacteria • In 1928, he isolated two strains of bacteria, and injected them into mice – Live R strain was harmless (mice lived) – Live S strain caused pneumonia (mice died) – When he injected the S Strain that was heat-killed, the mice lived • BUT.... When he mixed the live R strain with the heat-killed S strain and injected into mice, the mice died.
Griffith's Conclusions	• When the heat-killed bacteria mixed with the live harmless bacteria, something was exchanged between them, making the live harmless bacteria deadly • **Transformation** = process in which one strain of bacteria changes the gene(s) of another bacteria

Avery-MacLeod-McCarty	• Following Griffith (1943), scientists heat killed the virulent S strain and then selectively destroyed parts of the bacteria before combining with R strain – Destroyed proteins, lipids, carbs = mice died => something different was transforming bacteria – Destroyed nucleic acids = mice lived! => DNA was transforming bacteria • Demonstrated that DNA was the transforming agent
Hershey and Chase	• Experimented (1950) with bacteriophages to see if information is carried on proteins or DNA • Used radioactive elements to "mark" DNA and protein • Only the radioactive DNA was found in bacteria cells (not proteins) • Further supported Avery's experiment that genetic material is DNA
Discovery of the structure of DNA	• Many scientists contributed to determining the structure of DNA – Erwin Chargaff – Rosalind Franklin – James Watson & Francis Crick
Erwin Chargaff	• Worked with DNA nitrogen bases, discovered (1950): • In any sample of DNA, – # adenines (A) = # thymines (T) – # cytosines (C) = # guanines (G) • Therefore, in DNA, the bases are always paired: **A** with **T**, and **C** with **G**. • This is Chargaff's Rule!
Rosalind Franklin	• Worked with x-ray photography to try to find DNA structure • Her "Photo 51" revealed DNA's structure (1952) • Died of cancer in 1958
Watson and Crick	• Credited with finding the structure of DNA (1953) • Watson got a sneak peak at Franklin's x-ray photos and used them with other evidence • They described DNA as a double helix, with the strands held together by weak hydrogen bonds formed between the bases A-T and C-G.
DNA structure	• Looks like a twisted ladder made of nucleotides – The nucleotide: (hosphate group, sugar, nitrogen base • Sugars and phosphates make the sides of the ladder, nitrogen bases are the rungs • The atoms within the two strands are held together by strong covalent bonds • The two strands are held together by weak hydrogen bonds between the nitrogenous bases.
What bonds with what?	• A bond between two purines would be too wide. • A bond between two pyrimidines would be too narrow. • THUS, a purine always bonds with a pyrimidine. – A bonds with T – G bonds with C

Your turn...the structure of DNA

On the diagram:

- Circle and label a nucleotide.
- Label the sugar and phosphate molecules.
- Label the bases that are not already labelled
- Label a base pair.
- Label the sugar-phosphate backbones.
- Label the hydrogen bonds.



Summary: