1.1 The Structure of DNA

Lesson 1.1 - The Structure of DNA

**History of DNA research**
- DNA was discovered in 1869 by a chemist (Johann Friedrich Miescher) studying pus-coated medical bandages.
- In 1881, this new substance was named DNA (deoxyribonucleic acid) after the sugar (deoxyribose) found in the molecule and its acidic properties.
- A series of experiments in the early 1900s showed that DNA causes bacteria to change their behavior and allowed viruses to infect cells, indicating that it played a special role in living organisms.

**Avery MacLeod-McCarty Experiment (1944):**

1. **S-strain**
   - Injected into mice: live
   - No virus enters
   - S-strain injected into live mice.
   - Mice are not infected.

2. **R-strain**
   - Injected into mice: die
   - No virus enters
   - R-strain injected into live mice.
   - Mice are not infected.

3. **Heat-killed bacteria**
   - S-strain: alive
   - Dead S-strain: alive
   - S-strain injected into mice.
   - Mice are not infected.

4. **DNA extract**
   - Deoxyribonucleic acid (DNA) destroyed DNA and broke it down.
   - When “DNAase” (enzyme) was added, the mouse lived.
   - Conclusion: it must have been DNA that was transferred between the dead S-strain and living R-strain. This DNA transfer would have changed the cells and caused infection death.

**1919 - Russian biochemist Levene proposed the nucleotide sequence G-C, A-T.**

**1950 - Austrian chemist Chargaff discovered the (repeat) sugar + phosphate base.**

**Structure of the DNA Molecule**
- DNA is an extremely large molecule containing thousands of millions of atoms joined by chemical bonds.
- It is a pair of separate strands twisted together to form a Double Helix, however it is usually shown unwound to look like a ladder.

- Each DNA strand is made from repeated molecular units called nucleotides.
Each DNA strand is made from repeated molecular units called **NUCLEOTIDES**.

A single nucleotide contains a phosphorus attached to a **SUGAR** which is attached to 1 of 4 possible **BASES**.

- **4** different types: (A, T, C, G)

Sugar + Phosphate **ALWAYS** the same.
The DNA strands are created when sugar and phosphate from nucleotides bond together, forming the backbone or the "rungs" of the DNA ladder. There are two different DNA strands run opposite each other. The DNA nucleotides are composed of - phosphate, - sugar, - base.

**Complementary Base Pairing ( Chargaff’s Rule )**

- There are four different bases in DNA:
  1. Adenine (A)
  2. Thymine (T)
  3. Cytosine (C)
  4. Guanine (G)

- These bases **ALWAYS** match a specific base on the other strand:
  - Adenine pairs with Thymine
  - Guanine pairs with Cytosine

**Ways to Remember this:**

```
C O L G A T E
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© (curly) letters C, G
```

This relationship is called "complementary base pairing."
ANSWERS:

1. Deoxyribonucleic acid
2. Sugar, Phosphate, Base
3. Base
4. Adenine (A), Thymine (T), Cytosine (C), Guanine (G)
5. a) b) 

![DNA Structure Image]

5. c) Base pairs
6. d) Sugar and Phosphate

7. Adenine
8. Guanine
9. Adenine ALWAYS pairs with thymine & cytosine ALWAYS pairs with guanine
10. 

![DNA Base Pairing Image]

11. 

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<tr>
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