**Biotechnology Notes II: Genes, Genetics and Geneticists:**

**Genes:** What are they? What do they do? How do they do it? How are we using them?

**History:**

1. Mendel – Pea Experiments indicated the \_\_\_\_\_\_\_\_\_\_\_\_\_\_nature of genes.
2. Chemical nature of genes: Transforming Factor = DNA, DNA from dead mice and injected bacteria containing \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. Hershey and Chase: due to Atomic Bomb discovery radioactive isotopes available to use, they injected phage the DNA went in into the cells but left the protein coat behind; therefore DNA was the genetic material
4. Structure of DNA:
   1. Physicist Wilkins and Rosalind Franklin used \_\_\_\_\_\_\_\_\_\_\_\_ to help determine DNA existed in a double helix
   2. Chargaff determined that A=\_ and G=\_
   3. Linus Pauling thought DNA existed in an \_\_\_\_\_\_\_ helix
   4. Watson and Crick determined DNA existed in a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_helix.
5. Central Dogma: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
6. Dogma Revision: Exon is \_\_\_\_\_\_\_\_\_\_\_\_ Introns are excised and not used, transposons \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_and RNA can act as an \_\_\_\_\_\_\_\_\_\_

# GENES:

1. Make \_\_\_\_\_\_\_\_\_
2. Found on \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. Replicate \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. Like a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
5. Determine \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

# EVOLUTION

1. Genetic \_\_\_\_\_\_\_\_\_\_
2. Mutations: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_,\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_,\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. Effects of mutations:
4. Natural \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

## Molecular Biology:

1. DNA Structure: ATGC, phosphodiester bonds \_\_\_\_\_\_\_\_\_\_\_\_\_\_ bonds, complementary pairs are: \_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. DNA Structure: contains:
   1. nitrogenous bases:

1. purine: \_\_\_\_\_\_\_

2. pyrimidines: \_\_\_\_\_\_\_\_\_

b. nucleosides: add a sugar, ribose or deoxyribose

1. Adenosine, guanosine, 5-methy-uridine, thymidine, uridine, cytidine
2. nucleotide: add a phosphate
3. DNA functions with faithful \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. DNA is replicated using \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_polymerase
5. DNA function: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, code for\_\_\_\_\_\_\_\_\_\_\_, genetic \_\_\_\_\_\_\_\_\_, triplets are \_\_\_\_\_\_\_\_, one gene one protein and entire set of genes is a \_\_\_\_\_\_\_\_\_\_.
6. DNA is transcribed into \_\_\_\_\_\_\_\_\_\_\_
7. Protein Synthesis uses RNA: \_\_\_\_ not \_\_\_, tRNA carries \_\_\_\_\_\_\_\_\_\_\_\_\_, mRNA codes for \_\_\_\_\_\_\_\_\_\_\_\_\_\_
8. mRNA 🡪 Protein \_\_\_\_\_\_\_\_\_\_\_\_\_\_ i.e. new language with AA, initiation codon is\_\_\_\_\_\_\_\_\_ and codons include: \_\_\_\_\_\_,GA\_
9. Eukaryotes (\_\_\_\_\_\_\_\_\_\_\_\_\_\_organisms) vs Prokaryotes (\_\_\_\_\_\_\_\_\_\_\_ organisms)
10. Gene \_\_\_\_\_\_\_\_\_\_\_\_\_; uses repressors, operons e.g. lactose operon, transcriptional activators or transcription factors, enhancers

## Genomic Organization

1. Chromosomes contain \_\_\_\_\_\_\_\_\_\_ wrapped around \_\_\_\_\_\_\_\_\_\_\_\_\_in a structure called a \_\_\_\_\_\_\_\_\_\_\_\_
2. \_\_\_\_\_\_\_\_\_ and viruses serve as tools used in Biotechnology
3. \_\_\_\_\_\_\_\_\_\_\_\_\_\_DNA is junk DNA
4. Mutations in DNA are mostly are \_\_\_\_\_\_\_\_\_ with repair enzymes
5. Mutations can be either: \_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_, or\_\_\_\_\_\_\_\_\_\_\_\_\_
6. Human Genome sequenced by \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
7. And \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

## Protein Structure and Function

1. Proteins consist of many Amino \_\_\_\_\_\_\_\_\_\_ held together with Peptide \_\_\_\_\_\_\_\_\_\_\_
2. Polar and Nonpolar covalent bonds or regions of amino acids are used to fold proteins into different shapes based on:
   1. Polarity and stability: create hydrophobic and hydro\_\_\_\_\_\_\_\_regions of the protein
3. Hydrogen and disulfide bonds also contribute to protein stability
4. Fundamental structure:
   1. Primary sequence of \_\_\_\_\_\_\_\_.
   2. Secondary: Hydrophilic backbone folds so that hydrophobic aa are in the \_\_\_\_\_\_\_creating a water free hydrophobic environment: two arrangements are the \_\_\_\_\_ helix and \_\_\_\_\_\_ sheets
   3. \_\_\_\_\_\_\_ Structure: How the fundamental DOMAINS fit together Alpha and beta
   4. Quaternary Structure: more than one pp chain fit, e.g. Hb

**Biotechnology Notes III: SICKLE CELL ANEMIA UNIT**

1. Symptoms of anemia: \_\_\_\_\_\_skin, weakness and \_\_\_\_\_\_\_\_\_ (can be due to low iron, low number of RBCs or defective \_\_\_\_\_\_\_\_\_\_\_\_\_ Defective Hemoglobin causes sickle cell anemia.
2. People with Sickle Cell Anemia go through many crises when exposed to low concentrations of oxygen caused by infection, dehydration, high altitude or overexertion. \_\_\_\_\_\_ concentrations of oxygen induce the hemoglobin to deform the red blood cells to form a \_\_\_\_\_\_\_shape that does not properly flow through arteries or veins resulting in a crises. These crises are treated by blood \_\_\_\_\_\_\_\_\_\_\_, bed rest, and medications. Sickle Cell Anemia (a \_\_\_\_\_\_\_\_\_\_condition) occurs in one out of 400 African Americans. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_African Americans are heterozygous for Sickle Cell Anemia i.e have the Sickle Cell Anemia \_\_\_\_\_\_\_\_\_.

|  |  |
| --- | --- |
| **Normal Hemoglobin** | **Sickle Cell Hemoglobin** |
| Hb-A | \_\_\_\_\_\_\_\_\_\_\_ |
| 6th aa - \_\_\_\_\_\_\_\_\_\_ | 6th aa- glutamic acid |
| 2 alpha chains | 2 alpha chains |
| 2 beta chains | 2 beta chains |
| globular shape of 4 chains | globular shape of 4 chains |
| hold oxygen well | \_\_\_\_\_\_\_\_ hold oxygen well |
| RBCs last 120 days | RBCs last \_\_\_\_\_\_days |

**SICKLE CELL ANEMIA affects**

|  |  |
| --- | --- |
| **Liver** | **Bone Marrow** |
| processes dead RBCs | cannot make RBCs fast enough |
| overworked | overworked,\_\_\_\_\_\_\_\_\_\_ RBC |
| too much \_\_\_\_\_\_\_\_\_\_\_\_produced resulting in gallstones |  |